ROUGH NOTES

ON

HUMAN OSTEOLOGY.

BY

I. C. ROY, M.B.,
ASSISTANT SURGEON TO THE BULRAMPORE HOSPITAL, AND
PROFESSOR OF ANATOMY AND MIDWIFERY IN THE
BULRAMPORE MEDICAL SCHOOL,
LUCKNOW.

With one Illustration.

Lucknow:
D AT THE AMERICAN MISSION PRESS.
1877.

M18084

CC4

22300000589

C.C.Q.2

ROUGH NOTES

ON

HUMAN OSTEOLOGY.

BY

I. C. ROY, M.B.,

ASSISTANT SURGEON TO THE BULRAMPORE HOSPITAL, AND
PROFESSOR OF ANATOMY AND MIDWIFERY IN THE
BULRAMPORE MEDICAL SCHOOL,
LUCKNOW.

With one Illustration.

Lucknow:
PRINTED AT THE AMERICAN MISSION PRESS.

1877.

Digitized by the Internet Archive
in 2014

https://archive.org/details/b20410906

ROUGH NOTES

ON

HUMAN OSTEOLOGY.

THE HUMAN SKELETON is composed of 206 different bones, and consists of—

I. A SPINE—or the central column—composed of 24 pieces;

II. THREE CAVITIES;—of which the—

1. **Pelvis**—composed of 4 bones—is fixed to the lower end of the column;

2. **Thorax**—composed of 26 bones—is at the middle and in front of the column;

3. **Skull**—composed of 21 bones—is placed at the top of the column:

III. FOUR EXTREMITIES;—which are attached in pairs;—

1. **Two Upper Extremities**—composed each of 32 bones, and suspended from the sides of the middle cavity (THORAX:)

2. **Two Lower Extremities**—composed each of 30 bones, and connected with the sides of the lower cavity (PELVIS).

Besides, EACH EAR contains 3, and the THROAT has 1.
THE IRREGULAR BONES are excluded from the list.

INTRODUCTION.

Anatomical Position—is erect, with the arms hanging by the sides, having the palms of the hands turned forward with the thumbs outward.

The front is called ANTERIOR and the back POSTERIOR, the upper SUPERIOR and the lower INFERIOR.

Anatomical Terms.—The body being divided into two lateral halves by a median plane, whatever is situated towards or nearer to this plane (of division) is called INTERNAL or *inward;* and whatever is placed away or more distant from this median division, is called EXTERNAL or *outward.* But whatever is towards the hollow of a cavity—be it any cavity in the body—is called the INTERIOR or *inside,* while its outside is called the EXTERIOR.

Osteological Terms.—The DIRECTION of a projection is the way in which it goes or points; while the *direction of a plane,* is represented by a line, drawn perpendicular to the surface; the INCLINATION being the way in which that surface goes or slopes.

Projections—in bones are either large—TROCHANTERS (when prominent) and TUBEROSITIES; small—TUBERCLES and PROCESSES (if sharp); elongated—CONDYLES (when broad) and CRESTS; or simple—RIDGES and LINES.

Processes are of different kinds—SERRATED (or toothed), MASTOID (or nipple-like), ODONTOID (or tooth-like) and STYLOID (or pencil-like).

Depressions in bones—are FOSSÆ (broad) and SINUSES (narrow)—GROOVES (shallow) and FURROWS (long)—NOTCHES (or deficiencies) and CAVITIES.

HOLES and FISSURES—CANALS and FORAMINA.

Articular Surfaces are **smooth**—COTYLOID (or cup-like), GLENOID (or shallow), TROCHLEAR (or pulley-like) and FACETS (when flat).

Classification of bones:—

1. **Long bones**—as those of the extremities;
2. **Short** or **Cuboid bones**—as those in the spine, wrist, &c,
3. **Flat bones**—as those in the skull and pelvis;
4. **Mixed bones**—as those in the thorax.

Construction of bones.—All bones are composed of two sorts of structure :—

1. The **Cancellous**—SPONGY OR CELLULAR SUBSTANCE, containing in it a more or less number of empty spaces called **cancelli**. This forms the main bulk of the bones.

2. The **Compact layer**—which is dense and forms a covering to the spongy substance.

N.B.—The long bones have a hollow, called the **medullary cavity** along their centre, which is filled with a fatty substance, called the **medulla** or MARROW. They are, therefore, mainly composed of the compact layers. The spongy portion in the flat bones is called the *Diploë*. **Periosteum** is the skin of the bone,—a membrane that forms a covering outside and passes into the empty spaces (cancelli) and into the medullary cavity as well, forming an internal lining, under the name of **internal periosteum** or **Endosteum**.

Development of bones.—Like other things in the body, they are perfectly fluid or water-like at first. This liquid gradually becomes solid :—first as a transparent jelly, which hardens into an opaque cartilage; and then this cartilage gets perforated by a number of canals or passages, which penetrate into its different parts ; and soon in some portion of the cartilage, a minute point appears, which is as hard as bone. This bony point gradually enlarges ; and, encroaching upon even the vascular canals, converts the whole cartilage into one mass of bone. These points are called the **Points of Ossification** ; and a bone may have one or several such points in its development.

Repair of bones.—A bone that is broken, has its ends, at first united by a soft gummy substance, which surrounds the fracture—forming a swelling, that becomes bony and is called the PROVISIONAL CALLUS. This in time is absorbed, when the PERMANENT or DEFINITIVE CALLUS, which takes a longer time, permanently unites the broken surfaces together.

Articulation—is the junction or joint, between the different bones of the body ; and is formed of—

1. **The Articular Ends** OF THE BONES, which are covered by the—

2. **Articular Cartilages**, forming smooth and soft padding for the opposed surfaces of the bones, to facilitate motions ;

3. **Ligaments**, *i. e.* the strong tying bands, passing from round one articular surface to another ;

4. **Synovial Sacs**—or fine membranous bags, filled with an oily fluid, called SYNOVIA, which lubricates the moving surfaces.

Articulations are Classified into—

- I. SYNARTHROSIS or **Immovable articulation**—having only a thin plate of cartilage interposed.
  - 1. SUTURA.—(seams) having processes and indentations interlocking each other.
    - VERA (true)—formed by indented borders;
      - 1. DENTATA—with projections large and *tooth-like*;
      - 2. SERRATA—(*saw-like*), with projections small—and curved;
      - 3. LIMBOSA—having beveled or *oblique edges*.
    - NOTHA (false)—formed by rough surfaces.
      - 1. SQUAMOSA,—Scale-like and overlapping;
      - 2. APPOSITA,—with surfaces simply *applied* to each other.
  - 2. SCHINDYLESIS—(fissure-made);—a plate in a cleft.
  - 3. GOMPHOSIS—(nail-like).
- II. DIARTHROSIS or **Movable articulation,** having *Synovial bags* interposed.
  - 1. ARTHRODIA—Gliding-joint—by plain surfaces;
  - 2. ENARTHROSIS—Ball-and-Socket-joint·
  - 3. GINGLYMUS—Hinge-joint;
  - 4. AXONOIDES—Pivot-joint;
- III. AMPHIARTHROSIS or **Mixed articulation**—having a thick pad of fibro-cartilage interposed.

ABBREVIATIONS

USED IN THE MARGINS AS REFERENCE.

L. for Ligaments.
M. for Muscles.
A. for Arteries.
V. for Veins.
N. for Nerves.
T. for Tendons.
F. for Fasciæ.
G. for Glands.
Mb. for Membranes.
Ap. for Aponeurosis.

CHAPTER I.—THE SPINE—

A FLEXIBLE COLUMN, COMPOSED OF THE

VERTEBRÆ.—These are twenty-four in number, placed one above the other; each having

I. A Body—in front, which is solid; being itself convex before and concave behind, cupped above and below, the upper surface being smaller; and forming, when the bones are united together, an anterior pillar, (for support), which rests on the pelvis below, and sustains the head above and the chest in the middle:

II. An Arch—behind, forming a portion of the hollow tube, which is situated behind the solid pillar, and which, extending from the head to the loins, lodges the *Spinal Cord.* This arch is formed by

1. **Pedicles**—two, going backwards from the sides of the body, and having—
    - NOTCHES—on each edge—one *upper* and—one *lower*;
2. **Processes**—three—
    - ARTICULAR—two;—
        - *Superior*—with surface backwards,
        - *Inferior*—with surface forwards;
    - TRANSVERSE—going outwards, on each side, from the articular processes;
    - THE SPINOUS PROCESS—goes backwards from centre of the arch;
3. **Laminæ**;—which are the roots of the spinous process.

Vertebral hole;—bounded by body, pedicles and laminæ.

[**Structure**.—Body spongy; processes compact.

[**Development**—in **Three pieces**, separate at birth, which appear in the second month of gestation:—

TWO—FOR THE ARCH and processes—joining in the first year after birth;

ONE—FOR THE BODY—joining in the third year after birth.

EPIPHYSES—or additional points;—for the processes, begin at the sixteenth; and for the upper and lower surfaces of body, after the twentieth year; all uniting together by the thirtieth year.

Articulations—with ADJACENT VERTEBRÆ; HEAD above, PELVIS below, and RIBS on the sides at the middle.

Contd.—**Are Classified** into—
Dorsal—twelve;
Cervical—seven; and
Lumbar—five.

These, though in approaching each other, are much alike, yet they are distinguished by the—

Common Characters of each region: thus—

Lumbar—largest; with—
- **Body**—transversely large,
- **Pedicles**—backward,
- **Notches**—deep,
- **Processes**—
  - ARTICULAR—
    - *Superior*—with concave surface,
    - *Inferior*—with convex surface;
  - TRANSVERSE—thin and long,
  - SPINOUS—broad and square;
- **Laminæ**—broad and short;
- **Vertebral hole**—triangular.
- [**Development**—having an extra point, for the tubercle at the back of the superior articular process.

Dorsal—next in size; with—
- **Body**—triangular and antero-posteriorly large, having two DEMI-FACETS on its sides, and being concave posteriorly;
- **Notches**—middle sized;
- **Processes**—
  - ARTICULAR—with flat surfaces,
  - TRANSVERSE—long, thick, upwards and clubbed—with a facet at the top;
  - SPINOUS—prismatic and tuberculated;
- **Laminæ**—middle-sized.
- **Vertebral hole**—round or oval.

Cervical—smallest; with—
- **Body**—transversely large, thicker before, flat behind, concave above—having upward lips at the sides and situated lower than the processes;
- **Pedicles**—outward;
- **Notches**—equal;—upper being continuous with a groove on the transverse process;
- **Processes**—ARTICULAR—with flat and oval surfaces,
  - TRANSVERSE—short, forward and downward, being bifid at the summit, grooved above and perforated at the base, and having two roots;
  - SPINOUS—short and bifid;
- **Laminæ**—thin, long and inclined;
- **Vertebral hole**—large and triangular.

Peculiarities of Certain Vertebræ.

Lumbar—

Fifth—has the—

Body—much thicker in front, and

Sacro-lumbar & Ilio-lumbar L. | **Transverse processes**—strong (for attaching ligaments):

Fourth—is like the fifth.

[**First**—in DEVELOPMENT—has an extra point, for the Transverse process, forming at times a lumbar rib.

The **Transverse processes**—IN LENGTH—are arranged thus ;—greatest 3rd, 4th, 2nd, 1st, 5th—smallest.

Dorsal—

First—with one **full facet** above, **and a half one** below; has the—

Body—LIPPED above, like a Cervical;
Spinous process—thick and long:

Ninth—having **no half-facet** below;

Tenth—having **one full facet above**, but none below.

Eleventh—has the **Body** large, with **one full facet**; and
Transverse processes—short—WITHOUT ARTICULAR FACET at the tip.

Twelfth—has the **Body** and **Transverse processes**—like the Eleventh; and
Lower articular surfaces—convex.

Cervical—

First—called **Atlas**—has no Body, or Pedicles, or Spinous process; and consists of—

1. **Two lateral Masses**;—each having—
    1. *Transverse L.* | A TUBERCLE—on the inside, (for attaching a ligament);
    2. *Superior & Inferior oblique M.* | THE TRANSVERSE PROCESS—on the outside, which is clubbed (for attaching muscles of the head);
    3. ARTICULAR SURFACES—above and below;—
        SUPERIOR—being concave and oval;
        INFERIOR—concave and circular:
2. **Two Arches**—of which the—

    Longi colli—upper portion—M. | **Lesser arch**—is anterior, tubercular before (for attaching a muscle), and having an articular facet behind, for articulation with the Odontoid process of the next;

    Rectus capitis posticus minor M. | *Vertebral A. & Sub-occipital N.* | *2nd cervical N.* | **Greater arch**—is posterior, having a Tubercle behind (for attaching a muscle), and is grooved at its upper and lower aspects, behind each Lateral mass, corresponding to the Notches in others; (the upper Groove transmitting artery and nerve, the lower only nerve):

Contd.—[**Development**—in TWO PIECES at birth, as the lateral Masses, which join behind in the 3rd year after birth.

A THIRD PIECE, for the anterior arch, begins soon after birth and unites at sixth year.

Epyphisis—one, for the spine.

Second—called **Axis**—is strong and triangular; with the—

BODY—presenting—

A vertical Ridge—in front, separating TWO LATERAL DEPRESSIONS—(for attaching muscles); *Longi Colli M.*

Odontoid process—on the top, which is rough above (for ligaments) and has *Odontoid L.*

ARTICULAR FACETS—one in front, and—one behind;

ARCH—presenting—

Articular surfaces—

SUPERIOR—convex and outward being supported by the Body, Pedicles and Transverse processes;

INFERIOR—placed behind the upper and like to the others;

Notches—SUPERIOR—lying behind the Articular surfaces,

INFERIOR—being in front, as in the others;

Transverse processes—neither bifurcated nor grooved;

Laminæ—strong and prismatic;

Large posterior rectus and the Inferior oblique M. **Spinous process**—large, channelled below, and tuberculated behind (for attaching muscles of the head);

Vertebral Hole—kidney shaped.

[DEVELOPMENT—in **four pieces**—at birth;

TWO LATERAL—for the arch, commencing in the second month of conception and uniting in the first year after birth;

TWO—IN THE BODY—beginning in the sixth month of conception and joining together, and with the Arch in the third year;—

LOWER—for the Body, and

UPPER—from two lateral points, for the Odontoid process.

Seventh—called **Vertebra Prominens**—is large, having the—

Spinous process—long, thick and not bifurcated;

Transverse processes—irregular, and often wanting in the holes, with rudimentary ribs at times.

[**Development**—with AN EXTRA POINT—for the anterior root of the Transverse process, which in some cases is exaggerated into a cervical rib.

SPINAL COLUMN—viewed as a whole;—is one-third the entire height of the man, having 7 parts of it formed by the lumbar, 5 by the cervical and 11 by the dorsal vertebræ. Though tapering upwards in its general outline, it is divisible into THREE SMALLER PYRAMIDS;—one from the last lumbar vertebra upwards to the 4th dorsal; another from the last cervical upwards to the axis; and the third is inverted—from the first dorsal down to the fourth dorsal. The whole column is CURVED, being *anteriorly—concave* in the dorsal but *convex* in the cervical and lumbar regions, and is again slightly convex on the right side. It has—

I. Surfaces—four; viz.—

1. Anterior—narrow in the dorsal, wider in the cervical, and widest in the loins; being *longitudinally* convex above and below, but concave in the middle; while everywhere convex laterally (and covered by ligament).

Anterior Common Ligament.

2. Posterior;—presenting the—

Spinous processes—along the middle, which are horizontal above and below, but inclined and imbricated in the middle; with intervals—large in the loins and small in the back—(which are filled by ligaments);

Inter-spinous & Supra-spinous L.

Vertebral grooves—on the sides, becoming narrow downwards;—in the NECK and LOINS *shallow* and formed *by* the *laminæ* only; but *deep* in the BACK, formed *by the laminæ and transverse processes;* (and being everywhere filled by muscles);

Multifidus spinæ, Spinalis & Erector Spinæ Muscles.

Articular processes—external to above;

Transverse Processes—external still—the dorsal ones standing backwards;

3 & 4. Lateral—surfaces;—separated from the posterior surface, by the articular processes in the neck and loins, but by the transverse processes in the back; and presenting the—

1. Bodies of vertebræ—in front, with articular facets for the ribs in the dorsal region.

2. Intervertebral foramina—FORMED BY THE NOTCHES, being oval, and largest in the lumbar but smallest in the dorsal region; situated *between the transverse processes* IN THE NECK, but *in front of them* IN THE BACK AND LOINS; while everywhere, they are anterior to the articular surfaces, excepting those of the atlas. (They transmit nerves.)

Spinal Nerves.

Contd.—3. **Transverse processes**;—situated *between the intervertebral holes* IN THE NECK, where there are HOLES AT THEIR BASE, forming a canal (for an artery); but *behind the intervertebral holes* and *in front of the articular processes* IN THE LOINS; while IN THE BACK, they are *behind both the intervertebral holes and the articular processes.*

Vertebral Artery. |

II. Base—showing the cupped lower surface of the fifth lumbar vertebra.

III. Summit—showing the upper aspect of the arches and lateral masses of the atlas.

IV. Vertebral Canal—wide and triangular in the neck and loins, but narrow and rounded in the back; opening into the cranium above and into the sacral canal below, (and lodging the *Spinal Cord* with *its appendages.*)

[**Development**—of the *Spinal Column*:

OF THE ARCHES—begins above, in the eighth week, and then proceeds downwards;

OF THE BODIES—begins at the *Ninth Dorsal* (the middle of the series), and proceeds upwards and downwards to atlas and coccyx.

Uses—of the spinal column.—'To transmit the weight of the head and trunk to the pelvis, and thence to the lower extremities; and—being itself the seat of all motions of the trunk—to give passage to the spinal nerves and afford attachment to the numerous muscles and ligaments, with which it is connected.'

* * *

CHAPTER II—THE PELVIS—

A CAVITY OF INTERMEDIATE SIZE, WITH VERY STRONG AND MASSIVE WALLS, FORMED OF—

FOUR BONES;—

1 & 2. **THE SACRUM AND THE COCCYX**—situated behind, forming prolongations downwards of the Vertebral Column;

3 & 4. **THE TWO INNOMINATE BONES**—lying on the sides and in front, fixing the lower extremities below and supporting the abdominal organs above.

I. THE SACRUM AND THE COCCYX.

SACRUM—is pyramidal and placed like a wedge, between the Haunch-bones, to support the spinal column above, by the base; is formed originally of five pieces, separate up to the fifteenth year, but uniting in the twenty-fifth; is curved, being concave in front; and is inclined downwards and backwards. It has four surfaces, a base, an apex and a canal.

Surfaces—four; viz.—

Anterior—more extensive, being wider above; and concave longitudinally, presenting—

A. ALONG THE MIDDLE;—

The Bodies of five vertebræ—separated by—

TRANSVERSE RIDGES—four, which are smaller below:

B. ON EACH SIDE;—

1. **Anterior Sacral Holes**—four, corresponding to the intervertebral holes (and transmitting nerves); *Anterior Sacral N.* |

2. **Lateral Masses**—lying more external, formed by the combined transverse processes, and traversed by—

SHALLOW GROOVES—four, which are separated by—

SLIGHT RIDGES—(for fixing a muscle); *Pyriformis M.* |

Contd.—**Posterior**—convex and uneven, presenting—

A. ALONG THE MIDDLE;—

Ap. of Latissimus dorsi M.

The rudimentary Spinous Processes—for fixing the aponeurosis of a muscle;

- Upper—of the first, being distinct—
- Lower—forming a ridge, by the union of the second, third, and half of the fourth:
- A Spinal Groove—is formed by the deficiency of half of the fourth and the fifth spinous processes:

B. AT THE SIDES;—

Sacro-lumbalis, Latissimus dorsi, and Gluteus Maximus M.

The Sacral Grooves—continuous with the vertebral grooves above, (attaching muscles), and presenting—

1. **The Laminæ**—deficient in half of the fourth and in the fifth—to form the spinal groove;
2. **Tubercles**—representing the
   - Articular Processes; of which the—
     - Uppermost are well developed, for articulation with those of the last lumbar vertebra;
     - Second and third are very indistinct;
     - Fourth more distinct, forming the ridges on the sides of the spinal groove;
     - Fifth are prolonged in form of the—
       - **Cornicula Sacralia**—or sacral horns, arching over the
         - Scral Notches—(for transmitting nerves);

Fifth Sacral N.

3. **Posterior Sacral Holes**—four on each side, lying external to the articular tubercles and opposite to the anterior holes, but much smaller (and transmitting nerves):

Posterior Sacral N.

Contd.—*C. MORE EXTERNALLY;—*

Distinct Tubercles—representing the

TRANSVERSE PROCESSES—large, (for attaching ligaments) :—the

Sacro-Sciatic L. | UPPERMOST — of which, being very marked, appearing as a horizontal eminence separating the bâse from the posterior aspect :

Lateral Surfaces—broad above, narrow and edge-like below ; each presenting—

1. **An Auricular Surface**—semilunar and situated above, being vertically long, rough and directed outwards, downwards and backwards—for articulation with the INNOMINATE bone :
2. **Rough Depressions**—situated behind the auricular surface, (and fixing ligaments) ; *Sacro Iliac L.* |
3. **An uneven Edge**—below the auricular surface (for attaching other ligaments) ; *Sacro-Sciatic L.* |
4. **A Notch**—at the lowest part, (for transmitting nerves) : *Anterior branch of the fifth sacral N.* |

Base—is situated above, being wide transversely, for articulation with the 5th Lumbar Vertebra, and presenting—

A. ALONG THE MIDDLE ;—

1. **Oval Surface of Body**—in front, for articulation with the BODY of the last Lumbar Vertebra ;
2. **Triangular Opening** of the Sacral Canal—situated behind the body ;
3. **Edge of the spinous process**—lying still behind ;

B. ON THE SIDES ;—

1. **Superior Articular Processes**—of the first piece of sacrum, with surfaces concave—behind and inwards ;
2. **Superior Notches**—of the sacrum, lying in front of the articular processes, to form the last Intervertebral Hole ;
3. Alæ—or **Wings**—of the Sacrum, which are smooth and triangular surfaces, situated beyond the above ; and bounded by—

   A ROUND BORDER—anteriorly, which is continuous with the ILIO-PECTINEAL LINE.

Contd.—**Apex**—is below. and directed downwards and forwards having an—

ARTICULAR SURFACE—concave and oval, to articulate with the base of coccyx.

Sacral Canal—is continuous with the Spinal Canal, being large and triangular above. flattened at the middle and reduced to a groove at the lower part. (It lodges the trunks of nerves.)

Sacral N. |

[**Structure**—Mainly of spongy substance—enclosed in a compact layer.

[**Development**.—in FIFTEEN PIECES—at birth:—three for each vertebra, appearing like those in the regular vertebræ above;—the union proceeding from below upwards.

THE PIECES OF THE FIFTH—unite in the second year and join with the next in the 18th;

THE PIECES OF THE FIRST—unite in the 6th year and join with the others by the 30th.

THE LATERAL MASSES—develop after birth—IN FOUR PIECES—as the upper four transverse processes. These begin from above by about the 9th month of conception, unite with the bodies by the seventh year after birth; and blend with each other by the eighteenth year:

THE AURICULAR SURFACES—are formed each from two additional epiphyses, beginning at the twentieth and joining by the 30th year.

Articulations—with the SPINE above, the INNOMINATES on the sides and the COCCYX below.

☞N.B. The sacrum is wider and suddenly curved in the female; but is more uniformly and extensively curved in the male.

COCCYX—is triangular and composed of FOUR RUDIMENTARY VERTEBRÆ, the third and fourth being mere nodules. It has—

Surfaces—two; of which the—

Anterior Sacro-coccygeal L.

Anterior—is smooth and concave (being covered by ligament), and is normally continuous with the anterior surface of sacrum, being marked with—

Transverse Grooves—three, indicating the junction of the original FOUR PIECES of the bone:

Posterior Sacro-coccygeal L.
2 Glutei maximi M.

Posterior—is convex and irregular, and is, like the anterior surface, covered by a ligament. It (attaches muscles) and is marked with—

1. **Transverse Grooves**—in the middle, like those on the anterior surface;
2. **Rows of Tubercles**—on the sides, representing the—
   - ARTICULAR PROCESSES:—the uppermost being prolonged upwards as the—
     - **Horns of coccyx**—which ascend, to form, with the descending horns of sacrum, a HOLE (for the passage of nerve):

Fifth sacral N.

The laminæ and spinous processes, as also the vertebral canal and the intervertebral hole, are all wanting:

Borders—two; one on each side, and therefore—

Sacro-sciatic L.
Ischio-coccygei M.

Lateral;—which are both thin and uneven (for attaching ligament and muscles), each having—

1. **Eminences**—four, to represent the transverse processes; of which the UPPERMOST is the largest, curving upwards to join the lateral border of sacrum and form, at times, a HOLE—(for the passage of nerve);

Anterior branch of Fifth sacral N.

3. **Notches**—three, between the four eminences:

Base—oval and articular, to join with the SACRUM:

Levator Ani M. &
Sphincter Ani T.

Apex—tubercular or bifid, being deflected sometimes to the right and at others to the left side, and fixing muscles and a tendon.

[**Structure**—of spongy tissue, within a compact layer.

[**Development**—IN FOUR PIECES—**after birth**, uniting in pairs; thus—

	...	FIRST—appearing immediately after birth.
Late in life		SECOND—at tenth year,
	...	THIRD—at fifteenth year,
		FOURTH—at twentieth year.

Articulation—with SACRUM alone.

II THE INNOMINATE BONES

TWO—one on each side of the median plane, and exactly similar, forming, by their union before, the front and side-walls of the Pelvis. They are the largest of all flat bones; each having a large cup-like cavity, called the **acetabulum**, in the middle of its outer aspect; which marks the meeting of the original THREE PIECES of the bone—the **ILIUM** above, **PUBIS** before, and **ISCHIUM** below. The adjoining portions of these pieces, are known as their **bodies**; while the expansion of the Ilium is called its **Ala**, and the branches of Pubis and Ischium their **Rami**, forming the lower boundary of a big hole, characteristic of the bone, which is called the **Obdurator foramen**. Each of the two Innominate bones has—

Borders—four: of which the—

Superior—called the **Crest**—is curved like *f*, terminating at prominent angles at the extremities; and is thick, being divided, along its whole length, into—

1. Lips—two;—

External oblique & Latissimus dorsi M.

1. **Outer lip**—attaching (two—an abdominal before and a dorsal behind) muscles above, and a fascia below;

Lata of thigh F.

Transversalis & Quadratus Lumborum M.

2. **Inner lip**—attaching (before and behind—two) other muscles (of abdomen):

Internal oblique & Erector Spinæ M.

2. Interval—one, between the two lips, attaching a third set of (two—an abdominal before and a dorsal behind) muscles;

Anterior—is irregularly concave and divided into two portions;—

1. Outer portion—belonging to the Ilium, and presenting, from above downwards—

Tensor vaginæ & part of Sartorius M.

Poupart's L.

1. **The Anterior Superior Spinous process of the Ilium**—forming the front end of the upper border (and attaching muscles and ligament);

External Cutaneous N.

Sartorius M.

2. **A notch**—immediately below (transmitting nerve and attaching a muscle);

Straight T. of Rectus Femoris M.

3. **The Anterior Inferior Spinous process of the Ilium**—(which attaches the tendon of another muscle);

Iliacus Internus & Psoas magnus M.

4. **A shallow Groove**—(for the passage of the united tendon of two muscles); and then, in front of it, is the—

Psoas Parvus M.

Iliopectineal Eminence—indicating the place of division of the border into the two portions, and also the union of the Ilium with the Pubis. (It attaches a muscle).

Contd.—2. **Inner portion**—belonging to the Pubis, and presenting—from without inwards—

Pectineus M.

1. Anterior Surface of the pubis; —triangular, being wide externally at the Iliopectineal Eminence, and bounded behind by the Iliopectineal LINE; (and attaching a muscle);

Poupart's L.

2. Spine of the pubis—prominent (for fixing a ligament);

Pyramidalis & Rectus, & parts of Internal Oblique & Transversalis M.

3. Crest of the pubis; —horizontal and ridge-like, (for attaching four muscles —of the abdominal wall);
4. Angle of the pubis—indicating the commencement of the INFERIOR BORDER:

Inferior—is divided into two portions—

1. **Upper third**—vertical, having a—
   Rough oval surface—with striæ, for the SYMPHISIS PUBIS;
2. **Pubic Arch**—oblique, and formed of the—

Gracilis M.
Crus with the Erector penis or clitoridis M.

United Rami of Pubis & Ischium—sloping downwards and outwards, being straight in the male but concave and turned forwards in the female, (and attaching a muscle above and part of the generative organs below):

Posterior—is very uneven, presenting from above downwards—

Long and Short Sacro-Iliac L.

1. **The Posterior Superior Spinous process of the Ilium**;—(which is thick (for attaching ligaments);
2. **A small Notch**—below it;

Great Sacro-Sciatic L.

3. **The Posterior Inferior Spinous process of the Ilium**;—(which also fixes a ligament);

Pyriformis M.
Gluteal, Sciatic & Internal Pudic A. V. & N.

4. **The Great Sciatic Notch**—situated just below, to form the—
   GREAT SCIATIC HOLE—(for transmitting muscle, vessels and nerves);

Super. Gemellus, Levator Ani & Ischio-coccygeus M.
Lesser Sacro-sciatic L.

5. **The Spinous Process of the Ischium**—sharp and triangular, going downwards, backwards and inwards, (and fixing muscles and a ligament);

Internal Obdurator M.

6. **The Lesser Sciatic Notch**—smooth, to form the—
   LESSER SCIATIC HOLE—for (transmitting the tendon of a muscle);

Contd.—**7. Tuberosity of Ischium**—the most descending part of the bone, upon which we sit ;—marking the meeting of this border with the inferior, and having—

Lips—two ; viz :—

Quadratus femoris & Adductor magnus M.

1. **Outer lip**—blunt (and attaching muscles) ;

Infer Gemellus & Transversus perinei M.
Great Sciatic L.

2. **Inner lip**—prominent (for fixing muscles at the ends and a ligament in the middle), and—

Falciform process of Great sciatic L.

PROLONGED FORWARDS ON THE RAMUS (for fixing a process of ligament) forming a GROOVE—for lodging vessels and nerve.

Pudic A. V. & N.

Long head of Biceps, Semitendinosus & Semimembranosus M.

Interval—one, between the lips, broad and divided, by an oblique line, into a posterior and an anterior part (for attaching muscles):

Surfaces—two ; of which the—

Interior—is divided into two portions :—

I. POSTERIOR PORTION—for articulation, having—

Sacro iliac L.

1. **Rough depressions**—at the back (for fixing ligaments) ;
2. **Auricular surface**—semilunar, for articulation with SIDE OF SACRUM :

II. ANTERIOR PORTION—presenting—

Pectineus & part of Psoas parvas M.
Gimbernaut's L.

1. **Ilio-pectineal Line**—running forwards, from the front of the auricular surface : being rounded in the Ilium, where it is free, but sharp in the pubis (attaching muscles and a ligament) ; and dividing the surface into 2 divisions :
2. **Upper Division of Surface**—showing the—

Internal Iliac M.
A Nutrient A.

Internal Iliac Fossa—formed by the ala of the Ilium, directed upwards, forwards and inwards, being concave (and filled with a muscle) and perforated (for an artery) ;

Contd.—**3. Lower Division of Surface** —having—

Internal Obturator & Levator Ani M.

1. **A Smooth Surface**—behind, situated above and in front of the Sciatic Notches, and formed of the bodies of PUBIS and ISCHIUM; and concave (for attaching muscles);

2. **Obturator Hole**—or the **Thyroid foramen**—situated in front, and bounded by the PUBIS above, ISCHIUM behind, and the UNITED RAMI of these bones internally and below; (being large and oval in the male, but small and triangular in the female, and) having a—

Obturator Mb.

External & Internal obturator M.

CIRCUMFERENCE—that is uneven, (for fixing a membrane—to attach muscles by its anterior and posterior surfaces); and which is interrupted, at the outer and upper part, by the—

Obturator A. V. & N.

OBTURATOR GROOVE—going forwards and inwards, (to transmit vessels and nerves):

Exterior Surface—presents—

A. *In the middle;—*

The Acetabulum or **Cotyloid cavity**—for articulation with the head of the THIGH BONE; and formed 2/5 by ILIUM, 2/5 by ISCHIUM and 1/5 by PUBIS; having—

Cotyloid L.

1. **The Circumference**—very prominent (for attaching a fibro-cartilage which deepens the cavity);

Inter-articular or Round L.

Transverse L. being a portion of the Cotyloid L.

2. **The Cotyloid Notch**—in the lower part of the circumference; which is rough in the margins (for fixing a ligament), and is bridged over by another, that converts the Cotyloid Notch into the—

Small Articular A. & V.

COTYLOID HOLE—(for transmitting vessels into the joint);

Haversian G.

3. **The Cotyloid Groove**—running upwards, from the cotyloid Notch to the centre of the cotyloid cavity, and rough (for lodging a gland):

Contd.—*B. Behind the Acetabulum and upwards ;—*

The External Iliac Fossa—formed by the undulating DORSUM ILII or back of the Ilium, and marked with the—

Semi-Circular Lines—three, which are curved lines, going forwards from the upper part of the GREAT SCIATIC NOTCH, and dividing the Dorsum into four divisions :

Gluteus maximus M.

1. THE SUPERIOR SEMICIRCULAR LINE —that passes from the *back* part of the Great Sciatic Notch to the *Iliac Crest*, two inches in front of the Posterior Superior Iliac Spine, forming the inferior boundary of the—

Gluteus maximus M.

Upper Division of Surface—lying between it and the Crest, (and giving origin, with it, to a large muscle);

Gluteus medius M.

2. THE MIDDLE SEMICIRCULAR LINE —which is the *most marked* and largest, extending from the *upper* part of the Great Sciatic Notch to the Anterior Superior Iliac Spine, and forming the inferior boundary of the—

Gluteus medius M.

Second Division of Surface—lying between it and the Upper Curved Line, (and giving origin, with it, to another muscle);

Gluteus minimus M.

3. THE INFERIOR SEMICIRCULAR LINE —that passes from the *front* part of the Great Sciatic Notch to the Anterior *Inferior* Iliac Spine, forming the Inferior boundary of the—

Gluteus minimus M.

Third Division of Surface—situated between the Middle and Inferior Curved Lines, (and giving origin, with it, to a third muscle) :

Gluteus minimus M.

Fourth Division of the Dorsum Ilii—lying between the Inferior curved Line and the Acetabulum, is only covered by a muscle :

C. Above the Acetabulum ;—

Curved T. of Rectus femoris M.

A rough Impression—for attaching (the outer head of) a muscle :

Contd.—*D. Below the Acetabulum* ;—

The outer Surface of the Ischium—showing—

T. of External obturator M.

1. **A Horizontal Groove**—formed on the Body of the bone, and smooth (for the free gliding of a tendon) ;

Quadratus femoris & Adductor magnus M.

2. **The outer Edge of the Ischial Tuberosity**—(giving origin to two muscles) :

E. On the Inner side of the Acetabulum ;—

Obturator Mb.

1. **The Obturator Hole** or the **Thyroid Foramen**—which is bridged over, in the recent state, by a membrane ; and whose Circumference is interrupted by the—

Obturator A. V, & N.

Obturator Groove—situated above and on the inner side (transmitting vessels and nerves), and bounded in front by a border that is continuous with the outer portion of the circumference, and behind by a border that is continuous with the *inner* portion of the same) ;

2. **The Body of the Pubis**—which is situated above the Obturator Hole, and pyramidal in form, with the apex inwards and formed by the Spine of the Pubis, and the base outwards at the Ilio-pectineal Eminence; and which has two Surfaces and two Borders ;—

Pectineus M.

   1. **The Upper** or **Anterior Surface**—triangular, belonging to the anterior Border of the Innominate, and bounded behind by the Pectineal Line and externally by the Pectineal Eminence (and attaching a muscle) ;
   2. **The Lower** or **Posterior Surface**—belonging to the Inner Aspect, the upper portion being hidden by the descent of the Ramus from the Upper Border, and the lower portion alone appearing as the Obturator Groove :

Obturator Mb.

   3. **The Anterior** or **Inferior Border**—passing from the Pubic Spine outward towards the Acetabulum, and forming the anterior boundary of the Upper Surface and the outer or anterior border of the Obturator Groove (and fixing a membrane) ;
   4. **The Posterior** or **Superior Border**—forming the front portion of the Ilio-pectineal Line, from which descends the Arch of the Pubis :

Contd.—**3. The Arch of the Pubis**—forming the inner and lower boundary of the Obturator Hole, and formed by the United Rami of the Pubis and Ischium, and showing—

1. **A Horizontal Ridge**—which indicates the union of the Pubic with the Ischial Ramus;
2. **A Rough Surface**—throughout, (giving origin—above, in the middle and below—to three muscles).

Adductor longus, Adductor brevis & Addtr. magnus M.

Articulations—with the SACRUM and with each other.

[**Structure**—Spongy cellular tissue, enclosed in two compact layers.

[**Development**—in THREE PIECES **at birth,** from three points; appearing—in the second month of conception for Ilium, in the third month for Ischium, and in the fifth month for Pubis.

THE ARCH—becomes bony in the tenth year after birth; and a Y-SHAPED PIECE—between the three portions—is formed at the acetabulum in the fifteenth year.

IN FULL PUBERTY—the ILIAC CREST and the ISCHIAL TUBEROSITY, with the PUBIC SURFACE, get ossified from separate points.

* * *

THE PELVIS IN GENERAL.

It is a bason-like cavity inclined downwards in front—to rest on the Lower Extremities; and upwards behind—to support the Spinal Column. It is divided, by the INNOMINATE LINE, into two divisions—

I. **UPPER DIVISION**—called the **FALSE PELVIS**;—which is deficient in its anterior wall,—the posterior being only represented by the Vertebral Column; while the lateral walls are more complete and formed by the Innominate bones. It has—

Surfaces—two; viz.—

I. **Interior**—inclined downwards in front, and presenting—on each side—

1. **The Internal Iliac Fossa**—lying in front (for attaching a muscle);
2. **Sacro-Iliac Synchondrosis**—in the middle;
3. **Lateral Mass of the Sacrum**—lying behind.

Internal Iliac M.

Contd.—**II. Exterior**—presenting the—

External Iliac Fossa—formed by the **Dorsum of the Ilium**—which is wavy, and marked with the three Semi-circular lines, that divide the surface into four portions;

Gluteus Maximus M.

Upper portion—with UPPER CURVED LINE—attaching one muscle;

Gluteus Medius M.

Second portion—with SECOND CURVED LINE—attaching another muscle;

Gluteus Minimus M.

Third portion—with THIRD CURVED LINE—attaching a third muscle;

Fourth portion—situated immediately above and behind the Acetabulum, and consisting of two parts;—

Curved T. of Rectus femoris M.

1. FRONT PART which is just above the Acetabulum, and rough, for attaching a fourth muscle;

Gluteus Minimus M.

2. BACK PART—lying between the Lower Curved line and the Acetabulum, which is only covered by a muscle.

Circumferences—two;—

Superior—presenting the—

1. Iliac Crest—with its two lips and an interval—attaching two sets of muscles; thus—

External & Internal Oblique & the Transversalis M.

ANTERIORLY—three muscles of ABDOMEN;

Latissimus Dorsi, Erector Spine & the Quadratus Lumborum M.

POSTERIORLY—three muscles of BACK;

Tensor Vaginæ femoris & part of Sartorius M.
Poupart's L.

2. Anterior Superior Iliac Spine—attaching muscles and a ligament;

Sartorius M.

3. Notch below it—attachig a muscle;

Straight T. of Rectus femoris M.

4. Anterior Inferior Iliac Spine—fixing a tendon;

Psoas Magnus & Iliacus Internus M.

5. Groove—below it, transmitting the united tendon of two muscles;

Psoas parvus M.

6. Ilio-pectineal Eminence—attaching another muscle;

Contd.—**Inferior**—formed by the—

Innominate Line—which separates the *False* from the *True* Pelvis, and consists of the—

1. **Anterior Border of base of sacrum**—posteriorly; and
2. **Ilio-pectineal Line**—in front, attaching muscles and a ligament.

Psoas parvus, & Pectineus M. Gimbernaut's L.

Cavity,—which is wide and shallow, being large transversely and deficient in the anterior wall; and which has an oblique axis directed upwards and forwards to the navel (umbilicus.)

II. LOWER PORTION—called the TRUE PELVIS—which is smaller, but has the boundaries more complete. This has—

Walls—four;—

1. **Anterior Wall**—formed by the two Pubic bones with their symphisis—being only one and half inches deep in the middle;
2. **Posterior wall**—formed by the Sacrum and Coccyx—being about five inches deep;

3. & 4. **Lateral Walls**—formed mainly by the Ischium—being about four inches deep.

These four walls increase in depth gradually towards the back part, being continuous with one another above, but separated, at the middle, by the—

Holes—four, intervening between the four walls;—

Two Anterior—the Obturator Holes—being completed below by bone (Branches or Rami of the Pubis and Ischium);

Two Posterior—the Sciatic Holes—being completed below by ligamentous bands, stretched in a similar way, from the tip of the Posterior wall to the tips of the Lateral walls.

Great Sacro sciatic L.

Surfaces—or Aspects—two ;—both divided in bones, into 3 parts, by the Sciatic Notches on the sides, with the Pubic gap before :—

I. Exterior—consisting of three portions ;—

A. Posterior Portion—presenting—from behind forwards—

I. The Back Surface of the Sacrum and Coccyx—uneven with the—

1. Row of Spinous Processes—in the middle, terminating in the GROOVE below ;

2. Sacral Grooves—on the sides, continuous with the Vertebral grooves above, and subdivided, each into two, by the—

   1. ROW OF ARTICULAR TUBERCLES, with the—

      1. UPPERMOST well-developed, for articulation with the Fifth Lumbar vertebra ;

      2. SACRO-COCCYGEAL HOLE, formed below the middle, by the union of the Sacral descending and Coccygeal ascending Horns :

   2. LINE OF POSTERIOR SACRAL HOLES—lying just external to the Articular Tubercles, and transmitting nerves :

Posterior branches of the Sacral N.

3. Row of Transverse Tubercles—marking the outer limit of the Sacral Grooves, and being more prominent for attaching ligaments :

Sacro-sciatic L.

II. The back end of the Ala of Ilium—projecting, to form, with the sacrum—

A deep Groove—which is filled with strong ligaments.

Posterior Sacro-iliac L.

A small bit of the Dorsum of Ilium—situated on each side just above the Sciatic Notches.

Contd.—*B. & C. Lateral Divisions*—on the sides, approximating each other, in front, at the Symphisis Pubis, and presenting—

I. The Acetabulum—with its—

Cotyloid Ligament.

1. Circumference—prominent and uneven, for fixing a fibro-cartilaginons ring; and interrupted internally by the—

Transverse L. Inter-Articular & V.

2. Cotyloid Notch—that is bridged over by a portion of the same ring, forming a CANAL—for the passage of vessels into the joint;

Haversian G.

3. Cotyloid Groove—at the bottom, for lodging a quantity of fat:

Curved T of Rectus femoris M.

II. A rough Impression—above the Acetabulum, for attaching a tendon:

External Obturator M.

III. The Ischial Groove—situated below the Acetabulum, and transmitting the tendon of a muscle:

IV. The Obturator Foramen—situated in front and below the Acetabulum, with the—

Obturator Mb. External Obturator M.

1. Margins—rough, for fixing a membrane, that gives attachment to a muscle on this surface of it;

Internal Obturator M.

2. Surrounding surface—also rough, especially in front, for attaching the same muscle;

Obturator A. V. & N.

3. Obturator Groove—situated above and internally, and coursing, for the passage of vessels and nerves, obliquely along the lower border of the—

V. Body of The Pubis—situated above the Obturator Hole, and thus divided by the Obturator Groove, into two parts—

Pectineus M.

1. Upper Anterior Surface—belonging to the Anterior Border of the Innominate and wide externally, attaching a muscle;

External Obturator, Gracilis & adductor longus M.

2. Inner Lower Surface—situated close by the Symphisis Pubis, and rough, for attaching other muscles:

Gracilis & Adductors (longus, brevis & magnus) M.

VI. The Arch of Pubis—forming the anterior and lower boundary of the Thyroid Hole, fixing muscles, and marked with—

A RIDGE—indicating the union of the Rami of Pubis and Ischium.

Contd.—**II. Interior**—presenting, from behind forwards—

I. The Anterior Surface of Sacrum and Coccyx—concave, with the—

1. United Bodies of the vertebræ—in the median line ;
2. Anterior Sacral Foramina—lying by the side, (and transmitting nerves) ; *Anterior Sacral N.*
3. Lateral Masses of Sacrum—lying more external, and marked with the—
   - Ridges—(for attaching a muscle), & *Pyriformis M.*
   - Furrows—(for lodging nerves) : *Anterior Sacral N.*

II. The Sacro-iliac Synchondrosis :

III. A narrow portion of the Ilium—lying above the Sciatic Notches :

IV. The Interior aspect of the Cotyloid portion of the Innominate bone—(covered by muscles, and) marked with the— *Internal Obturator & Levator Ani M.*

Y-shaped junction of the Ilium, Ischium and Pubis :

V. The Thyroid Portion of Ischium and Pubis—showing the—

1. Posterior surface of body of Pubis—situated above, and divided unequally into two parts, by the—

   Obturator Groove—traversing obliquely along its lower border (and transmitting vessels and nerves) and which is situated at the upper and outer part of the— *Obturator A. V. & N.*

2. Thyroid Hole—that has the margins uneven throughout, (for fixing a membrane,) and has the surrounding surfaces rough (for attaching a muscle) ; *Obturator Mb. Internal Obturator M.*
3. Lower portion of the Ischium—with the—
   1. Inner Surface of the Body—rough (for attaching a muscle, and bounded) below by the— *Internal Obturator M.*
   2. Projecting inner Border of the Tuber Ischii—prolonged forwards, along the Ramus, (for attaching a process of ligament, to support vessels and nerves) : *Falciform process of the Great Sciatic L. Internal Pudic A. V. & N.*
4. Arch of the Pubis—formed by the united Rami of Pubis and Ischium, and marked by—

   A Transverse Ridge—about the middle, indicating the union of the two pieces of bone.

Contd.—**VI. The back of the Pubis**—showing the meeting of the bones of the two sides, which unite above (by the intervention of a fibro-cartilage); but diverge below, going downwards and backwards, on each side, in the form of the Arch of Pubis.

Circumferences—two; of which the—

Superior—called the **Brim** of the True Pelvis,—is formed by—

1. **The Sacro-Vertebral Angle**—at the back part, formed by the projecting union of the Sacral with the Vertebral column:
2. **The Linea Innominata**—presenting from behind forwards—
   1. The Anterior border of Ala of Sacrum;
   2. The Sacro-Iliac Synchondrosis;
   3. The Ilio-Pectineal Line—divided by the Ilio-Pectineal Eminence into two portions; thus—
      1. ILIAC PORTION—posteriorly, round (and attaching muscles);

         Levator Ani & Psoas parvus M.
      2. PECTINEAL PORTION—in front—sharp (and attaching muscle and ligament both).

         Pectineus M. & Gimbernant's L.
3. **The Spine and Crest of Pubis**—in front, (attaching—the spine—a ligament, and the crest—two muscles):

   Poupart's L.
   Pyramidalis & Rectus Abdominis, M.
4. **The Symphisis Pubis**—formed by the union of the two side-bones at the median line.

Inferior—is divided by three eminences into three notches:—

I. Eminences—three;—of which the—

Posterior one—is sharp and formed by the SACRUM AND COCCYX, (attaching muscles at the tip, and muscle and ligaments at the sides);

Sphincter Ani & Levator Ani M.
Ischio coccygei M. & Sacro sciatic L.

Lateral two—are broad and rough, formed on each side by the descending TUBEROSITIES OF THE ISCHIUM, (attaching muscles and a ligament.)

Inferior Gemellus, Quadratus femoris Semitendinosus, Semi-membranosus, Biceps & Adductor magnus M.
Great Sacro-sciatic L.

Contd.—**II. Notches**—three ; of which the—

Triangular L.
Crus penis with the Erector penis M.

Anterior—called the **Arch of Pubis**—is thick and angular, being bounded above by the Symphisis (pubis) and on the sides by the united Rami (of Pubis and Ischium), attaching, by this margin, (a ligament above and portions of) the Generative Organs below ;

Great & Small Sacro-sciatic L.
Lesser Sacro-sciatic L.
Gemellus Superior
Levator Ani & Ischio coccygeus M.

Lateral—called the **Sacro-Sciatic notches**—are thin and curved, being formed above by the Ilium, in front by the Ischium, and behind by the Sacrum and Coccyx, attaching ligaments, that convert them into holes ;—each being subdivided, by the Ischial Spine, situated in front (attaching one of the same ligaments, beside some muscles) into the—

Pyriformis M.
Gluteal, Sciatic & Internal Pudic A. V. and N.

1. **Greater Sacro-Sciatic Notch** —situated above, (for transmitting muscle, vessels and nerves) ;

Obturator internus M.

2. **Lesser Sacro-Sciatic Notch**—situated below, (for transmitting the tendon of a muscle.)

Cavity—of true pelvis—deep and curved behind, because of the curve of the Sacrum and Coccyx, but shallow and straight in front, at the Symphisis Pubis ; forming a curved canal, whose convexity corresponds with the vertical curve of the anterior surface of the Sacro-coccygeal column. It is more extensive latterally at the upper part, but obliquely in the middle, and antero-posteriorly below ; having—

1. The Axis of the Pelvic Cavity—describing the curve of the—

Circle of Carus—whose centre is placed—ONE INCH IN FRONT of the Symphisis Pubis :

2. A Midplane—dividing the cavity into an upper and a lower half, and passing through the Spine of Ischium and Third Sacral vertebra ; and which is inclined to the horizon at an angle of 30 degrees, and has the—

Diameters—three ; of which the—

1. **Antero-posterior**—measures four and a half inches ;
2. **Oblique**—measures five inches ;
3. **Transverse**—only four and a half inches.

Contd.—**Openings**—two—called the **Straits** of the *True Pelvis ;* which are inclined so as to meet one another at an inch in front of the Symphisis pubis ; their—

Axes—if produced, cutting each other, in the middle of the cavity, and falling—of the upper opening—upon the lower third of the Sacrum, and of the lower opening—upon the Sacro-vertebral Angle :

Superior Opening — or the **Abdominal strait**—also called the **Inlet** of the true pelvis—is heart-shaped, because of the Sacro-Vertebral projection at the back ; and is inclined to horizon at an angle of 60 degrees, increasing to 65° in the male and deminishing to 55° in the female, and having—

Diameters--three ; of which the—

TRANSVERSE—is over five inches ;

OBLIQUE—from Ilio-pectineal Eminence to the opposite Sacro-iliac Synchondrosis—is below five inches ;

ANTERO-POSTERIOR—or Conjugate—from Symphisis Pubis to the Sacral Promontory—is only four inches.

Inferior Opening—or **Perineal strait**—also called the **Outlet** of the True Pelvis—is irregular in bones; but is lozenge-shaped with ligaments. stretched from the Sacrum and Coccyx to the Tuber Ischii;—forming then, though theoretically two, but practically a single plane, passing from the Symphisis Pubis to the Sacro-coccygeal articulation (that allows of motion to Coccyx in all ages in the female). This plane is inclined to the horizon at an angle of fifteen degrees, having—

Sacro-Sciatic L. |

Diameters—also three ; of which the—

ANTERO-POSTERIOR—from tip of Sacrum to Symphisis Pubis, is five and half inches ;

TRANSVERSE—between posterior part of the Tuber Ischii, is four inches :

OBLIQUE—from middle of pubic arch to middle of opposite Ligament, is about five inches.

Sacro-Sciatic L. |

DIFFERENCE BETWEEN THE.

Male Pelvis and	**Female Pelvis.**
1. **Cavity**—is narrow and deep, with **apertures** small;	1. **Cavity**—is shallow and broad, with **apertures** large;
2. **Bones**—are thick and strongly marked, with angles abrupt and ridges prominent;	2. **Bones**—are less massive and less marked, being generally more rounded and smooth;
3. **Innominates**—are stout and COMPACT, and approximated together, to give firm support to the strong muscles of the thigh and trunk; giving a compact and rounded outline to the male pelvis;	3. **Innominates**—are spreading further outwards, causing a wider separation of the Crests of Ilium and the Tuberosities of Ischium; thus making the female HIPS SO MUCH MORE PROMINENT and characteristic;
4. **Sacrum**—is long and very curved, and **Sacro-vertebral angle** very prominent;	4. **Sacrum**—is wider and less curved, the upper part almost straight; and the Promontory therefore less prominent;
5. **Obturator Hole**—is oval and large;	5. **Obturator Hole**—is triangular and small;
6. **Spine of Ischium**—is prominent, and the **Symphisis pubis** deep;	6. **Symphisis pubis**—short and the **Coccyx** more moveable;
7. **Brim**—is heart-shaped and prominent;	7. **Brim**—is circular, rounded and smooth;
8. **Pubic arch**—is narrow and straight.	8. **Pubic arch**—is wide, curved and everted.

Inclination—or angles with horizon, and the **Diameters**—in inches, in the Female Pelvis; thus—

		Antero-posterior	Oblique	Transverse
BRIM	... 60°	4	4½	**5**
MIDPLANE	... 30°	4½	**5**	4½
OUTLET	... 15°	**5**	4½	4

FŒTAL PELVIS—is very small;—the True pelvis, is specially so—because of the very rudimentary state of the generative organs then; and the Alæ of the Innominates are quite flat: the Sacrum and Pubis develop but little at that age, so that the transverse diameters are then much shorter than the antero-posterior. Fœtal Pelvis is inclined more obliquely, causing the characteristic prominence of the belly in children.

CHAPTER III.—THE THORAX—

The largest cavity of Skeleton, being an ossious cage, connected with the middle portion of the spine, and formed of—

1. THE DORSAL VERTEBRÆ—behind,
2. THE STERNUM—before, and
3. THE TWELVE RIBS—with their CARTILAGES—at the sides.

STERNUM—

A flattened column—situated along the middle line in front and consisting of three portions—

I. MANUBRIUM—or the handle—which is triangular and situated above, with the base upwards, and the apex truncated, having—

Surfaces—two—

1. Anterior—looking slightly upwards, being vertically concave and laterally convex (and attaching the aponeurosis of two muscles);

Sterno-mastoid & Pectoralis major M.

2. Posterior—looking slightly downwards, being concave vertically and plane laterally (and attaching two other muscles):

Sterno-hyoid & Sterno-thyroid M.

Borders—four—

1. Upper—longest and thickest, presenting the—

1 & 2. Articular Surfaces—at the ends, which are oval and laterally concave, but antero-posteriorly convex, for articulation with the Clavicle;

3. Inter-clavicular Notch—in the middle, which is curved (for attaching a ligament):

Interclavicular L.

2. Lower—short, oval and rough for amphiarthrosis with the Gladiolus:

3 & 4. Lateral—sloping downwards and inwards, and presenting from above downwards—

1. A Concave rough surface—for inserting the Cartilage of the First Rib;
2. A thick curved edge—forming the first Intercostal space;
3. An Articular Facet—to form with that in the Gladiolus a cavity for articulation with the Second Costal Cartilage.

Contd.—**Articulation**—with the Gladiolus below, and on the sides with the Clavicle, the First costal cartilage and the half of Second.

II. GLADIOLUS—or the shaft or blade, which is formed originally of four pieces; and is larger, narrower and thinner, being wider below and having—

Surfaces—two—

1. **Anterior**—looking forwards and upwards, being marked with the—
   1. **Transverse Ridges**—three—separating the original four pieces of bone;
   2. **Sternal Foramen**—in the lowest ridge, passing through the bone, between its third and fourth pieces:
2. **Posterior**—slightly concave, with the ridges less distinct, (and attaching a pair of muscles):

Right & Left Triangularis Sterni M.

Borders—four—

1. **Upper**—short and thick, for amphiarthrosis with the Manubrium;
2. **Lower**—short and thin, for amphiarthrosis with the Ensiform appendix;
3. **& 4. Lateral**—longest, presenting from above downwards—
   1. **The Upper Facet**—at the upper end, for forming with that on the Manubrium a cavity for articulation with the Second Costal Cartilage;
   2. **A Series of Four rough Cavities**—for articulation with the Third, Fourth, Fifth and Sixth Costal Cartilages;
   3. **A series of Five shallow Notches**—separating the articular cavities and corresponding to the intercostal Spaces;
   4. **The Lower Facet**—at the lower end, forming with that on the Ensiform appendix, a cavity for articulation with the Seventh Costal Cartilage.

III. ENSIFORM or **XIPHOID APPENDIX**—which is cartilaginous in youth and ossified at the upper part in the adult. It is very variable in size, shape and direction, presenting—

A Base—at the upper part, which joins with the Gladiolus;
An Apex—below, which attaches a tendinous raphe;
Surfaces—two—

Anterior—(attaching a ligament);

Posterior—(attaching muscles):

Costo-xiphoid L.
Diaphragm & Triangularis sterni M.

Contd.—**Borders**—two—lateral, (attaching an aponeurosis and) presenting—an articular facet at the upper part, to form with that on the Gladiolus a cavity for articulation with the Seventh Costal Cartilage.

Ap. of abdominal M.

The Entire Sternal Column—formed of these three pieces, is symmetrical, being convex in front and concave behind, with—

Surfaces—two—

1. Anterior—looking forwards and upwards;
2. Posterior—looking backwards and downwards:

Borders—lateral—being sinuous, with—

Articular depressions—seven (to receive the first seven cartilages of the ribs) which are separated by—

Inter-articular notches—six, gradually decreasing in size downwards, and corresponding to the first six Inter-costal spaces.

N. B. The first cartilages are *inserted* into the first depressions; while the other cartilages are articulated in a diarthrodial way.

Structure—very spongy within.

Development—in four pieces at birth; the uppermost appearing in the sixth month of conception; and ossification proceeding from above downwards:
The LOWEST piece appears after birth; and the UNION takes place thus—

Fifth to Fourth—in twenty-years;
Fourth to Third—in twenty-five;
Third to Second—in thirty-five or forty;
Second to First—in extreme old age.

The OSSIFIC POINTS are irregular;—the Manubrium, having sometimes one, and at others two or three; and so likewise have the other four pieces of the bone.
The Ensiform Appendix begins to ossify from its upper part in from two to twenty years of age.

☞ THE STERNUM—is shorter and more obliquely placed in the female than in the male.

THE RIBS--

Are elastic arcs, forming the lateral boundary of the cavity of Thorax; being twelve in number on either side, each presenting the—

I. Head—at the back end, showing the—

Articular Surface—on the summit, for articulation with the sides of two adjacent Vertebræ. and divided into two portions (of which the lower is larger) by—

A horizontal Ridge—which is rough (for attaching a
Inter-articular L. | ligament):

II. Neck—which is the next portion of the rib, being
Middle or Inter-osseous Costo-transverse L. | about an inch in length, and lying between the Transverse Processes of the Vertebræ (and attaching a ligament):

III. Tuberosity—forming the outer limit of the neck, being situated on the outer and back part of the rib, and divided into two portions;—

1. The articular portion—below, to articulate with the Facet at the tip of the Transverse process of the Vertebræ, situated below;
2. The non-articular portion—situated above and
Posterior Costo-transverse L. | rough (for fixing a ligament):

IV. Body—or **Shaft**, which is the remaining portion of the rib; being flat, thin and curved, so as to be concave within; and having the—

1. **Angle of the rib**—an oblique ridge, situated a little in front of the Tuberosity, and passing downwards and forwards (attaching muscles on the outer surface, thus—
Accessorius M. | *Upper six*—one,
Sacro-lumbalis M. | *Lower six*—another):
2. **Surfaces**—two; both of which are divided by the Angle into two parts, that are different in curves, planes, and in their direction; thus—

Inner Surface—smooth. and—*upwards* behind the Angle, but *dowwards* before the angle—presenting the openings of the nutrient canals, going back-
Diaphragm M. | wards; (the six lowest attaching a muscle anteriorly):

Outer Surface—having two very distinct portions;—

Posterior portion—situated *behind* the Angle, being very abruptly curved and looking downwards; and being longer in the lower ribs, and rough and strong (for attaching muscles;—
Cervicalis ascendans M. | *Four below the First*—one;
Longissimus dorsi M. | *All*—another):

Anterior portion—situated *in front* of the Angle, and looking upwards, (attaching other muscles;—
Serratus magnus M. | *Upper eight*—one of Scapula;
Internal oblique M. | *Lower six*—one of abdomen).

Contd.—THE ANTERIOR ANGLE—is an indistinct oblique ridge, situated on the outer surface, near the front end, of some of the true ribs, (and giving attachment to other muscles ;—

Pectoralis minor M.	*Third, Fourth and Fifth*—to one ;
Pectoralis major M.	*Sixth*—to another) :

3. Edges—two ; of which the—

Upper—is round and blunt (for giving attachment to muscles ;—

External Intercostal M.	*All but the First* throughout—to one, and
Internal Intercostal M.	anteriorly—to another;
Levatores costarum M.	*All* between the Tubercle and Angle—to a third ;
Serratus posterius superior M.	*Second, Third, Fourth and Fifth,* a little beyond the angle—to a fourth):

Lower—presenting—

	A GROOVE—that begins at the Tuberosity, and, running towards the anterior extremity, disappears at the junction of the middle
Intercostal A. V. & N.	with the front third of the bone, lodging vessels and nerves, and bounded by—
Internal Intercostal M.	TWO LIPS ;—of which the— INNER LIP—(attaches a muscle) ;
	OUTER LIP—which is lower, thin and sharp, (gives attachment to other muscles ;—
External Intercostal M.	*All* throughout—to one ;
Serratus Posticus Inferior M.	*Last four,* near the angle—to another).

V. Anterior Extremity—which is a porous, oval and concave surface, into which the costal cartilages are fixed.

Development—mainly from one point, for each rib, appearing even before those in the Vertebræ. Two other points, for the Head and Tuberosity, appear after the sixteenth year of age.

THE RIBS IN GENERAL—increase in length from the First to the Seventh, and again decrease in length from the Seventh to the Twelfth ; while their curves enlarge from above downwards, as also the incliuation of their surfaces. They are—

Classified—according to their connection at the ends, into the—

1. **Vertebro-sternal** or **True ribs**—which are the upper seven ;
2. **Vertebro-costal** or **False ribs**—which are the next three, *i.e.* the Eighth, Ninth and Tenth ;
3. **Vertebral** or **Floating ribs**—which are the last two ; *i.e.* the Eleventh and Twelfth.

Peculiarity—occurs in four ribs; thus—

First rib—is horizontal, short and stout, with an abrupt curve, having the—

- **Surfaces**—looking *upwards* and *downwards*:
- **Edges**—inner and outer; of which the OUTER is thick and the INNER sharp:
- **Head**—round, with ONE ARTICULAR FACET—for articulation with the body of the First
  Longus colli M. | Dorsal Vertebra, (and attaching a muscle in front):
- **Neck**—slender and rounded:
- **Tuberosity**—prominent and on the outer border:
- **Angle**—wanting; and consequently there is no twist in the shaft:
- **Anterior Extremity**—large and thick (attaching
  Subclavius M. | superiorly a muscle):
- **Lower surface**—wanting in any groove:
- **Upper surface**—marked with—
  1. *Anterior Scalenus M.* | A TUBERCLE—behind the middle, and towards the inner border (for attaching a muscle);
  2. *Anterior Scalenus M.* | A RIDGE—passing, from the tubercle, forwards and outwards (and attaching the same muscle);
  3. TWO GROOVES—separated by the ridge;
     - *Subclavian V.* | ANTERIOR—transmitting a vein;
     - *Subclavian A.* | POSTERIOR—transmitting an artery;
  4. A ROUGH IMPRESSION—between the Ridge
     Middle Scalenus M. | and the Tuberosity (for attaching a muscle).

Second Rib—has no angle or twist, but has the—

- **Surfaces**—
  - OUTER—neither horizontal nor quite vertical,
    Serratus magnus M. | presenting a rough EMINENCE at the middle, (for attaching a muscle);
  - INNER—more downwards than those of the
    Intercostal A. V. & N. | other ribs, and presenting the Groove (for vessels and nerves).

Tenth Rib—has a SINGLE ARTICULAR SURFACE on the Head, for articulation with the side of body of the Tenth Dorsal Vertebra.

Eleventh and **Twelfth Ribs**—have the—

- **Head**—large with only ONE FACET for articulation with the side of body of the Eleventh or of the Twelfth Dorsal vertebra:
- **Tuberosity** and **Neck**—wanting, as these ribs are not connected with any Transverse processes:
- **Anterior End**—slender:
- **Development**—wanting in the Epiphysis for the Tuberosity, that does not exist.
- **The Eleventh**—has a slight Angle and an indistinct Groove; which are quite absent in the TWELFTH.

THE COSTAL CARTILAGES-

Are white and elastic cartilaginous bars, forming the anterior prolongations of the ribs, to which they are attached by their outer ends. They have their—

I. Breadth—greater externally. and diminishing from the first to the last—like the Intercostal Spaces ; the First and Second are equally broad throughout ; while the Sixth, Seventh, Eighth and Ninth are enlarged at the points where they join with each other :

II. Length—increasing from the First to the Seventh, and again decreasing from the Seventh to the Twelfth—like the Ribs themselves :

III. Direction—various ; thus—

The First—goes downwards anteriorly,
The Second—being horizontal ; while—
The others—are going obliquely upwards, at their inner ends : the curves becoming more sudden, from the Fourth downwards :

IV. Surfaces—two ; of which the—

Anterior—is convex (giving attachment to muscles ;—

Pectoralis major M.	*Five from the Second*—to one of the shoulder;
Rectus abdominis M.	*Three from the Fifth*—to one of the abdomen):

Posterior—concave, (attaching other muscles ;—

Sterno-Hyoid M.	*First*—one ;
Sterno-Thyroid M.	*Second*—another ;
Triangularis Sterni M.	*Next Four*—a third ;
Diaphragm & Transversalis abdominis M.	*Last Six*—two others) :

V. Borders—two ; of which the—

Upper—is concave, (attaching muscles ;—

Subclavius M.	*The First*—one ;
Intl. Intercostal M.	*The Rest*—others) :

Lower—is convex ; the SIXTH, SEVENTH, EIGHTH and NINTH presenting Articular Surfaces ; and—

Internal Intercostal M.	(*All but the Last*—attaching muscles of the chest ;
Internal oblique M.	*Six Lowest*—attaching besides a muscle of the abdomen) :

VI. Outer End—fixed, and at once continuous with the osseous structure of the rib :

VII. Inner End—being different in its connections ; thus—

Of the First—*fixed* to the first notch of the Sternum ;
Of the other True ribs—convex and smooth, and ARTICULATED with the six other *articular* depressions on the side of the Sternum ;
Of the False ribs—articulated with the *contiguous* upper ones ;
Of the last two—free and floating.

THE THORAX IN GENERAL—

Shape resembles a cone, with the apex above and truncated, and the base below and oblique; the general AXIS being not vertical, but inclined from above downwards and forwards. It is flattened before and behind, presenting—

Surfaces—or Aspects—two;—

Exterior—divided into four regions; thus—

1. *ANTERIOR REGION*—inclined from above downwards and forwards, presenting the—

(1.) **Anterior Surface of the Sternal Column**—in the middle, (attaching an aponeurosis, and) articulating with the—

Ap. of Pectoralis major M.

(2.) **Costo-sternal Cartilages**—on the sides, increasing in length and curvature from above downwards, (attaching muscles) and being separated by—

Pectoralis major & Pectoralis minor M.

INTERVALS—which diminish from above downwards, (and are filled, in the recent state, with muscles):

Intercostal M.

2. *POSTERIOR REGION*—convex from above downwards, but alternately concave and convex from side to side, presenting—from within outwards—

(1.) **The Line of Spinous Processes of the Dorsal Vertebræ**—along the middle, imbricated (attaching muscles) and separating—

Inter-spinalis & Spinalis, Semi-spinalis & Multifidus Spinæ M.

(2.) **The Vertebral Grooves**—on the sides, which are (filled with muscles, and) traversed at the bottom, by the—

Spinalis & Semi-spinalis dorsi & the Multifidus spinæ M.

ROW OF ARTICULAR PROCESSES;

(3.) **The Row of Transverse Processes**—of the Dorsal Vertebræ, clubbed, (attaching muscles and) forming the outer boundary of the Vertebral Grooves, and intervening between—

Semi-spinalis, Rotatores & Multifidus spinæ M.

The Row of Tuberosities of the Ribs—(attaching ligaments):

Posterior Costo-transverse L.

(4.) **A triangular Space**—getting broader downwards, (covered with muscles and) bounded externally by—

Sacro-lumbalis & Longissimus dorsi M.

(5.) **An Interrupted Oblique Line**—formed by the ANGLES of the ribs (attaching muscles:)

Sacrolumbalis & the Accessorius M.

3 & 4. *LATERAL REGIONS*—more convex in both directions, being directed upwards above, outwards in the middle, and downwards below, and presenting the—

Contd. (1.) **Smooth portion of the Ribs**—running downwards and forwards, (attaching muscles) and being separated by the—

Serratus magnus & Pectoralis minor M.

Intercostal Spaces—which are here wider above, below and behind, than in the middle or in front, (and are closed by muscles in the fresh state);

Internal & External Intercostal M.

(2.) **Cartilages of the Vertebro-costal and of the Floating Ribs**—at the lower part only, (covered by a muscle of the abdomen).

External oblique M.

Interior—divided likewise into four regions; thus—

1. *ANTERIOR REGION*—looking downwards and backwards, presenting the—

Posterior Surface of the Sternum—Ensiform Appendix—and of the Sterno-costal Cartilages—(attaching several muscles):

Sterno-hyoid Sterno-thyroid, Triangularis sterni Diaphragm, & Transversalis abdominis M.

2. *POSTERIOR REGION*—concave, presenting the—

(1.) **Bodies of the Dorsal Vertebræ**—forming a CURVED RIDGE, along the centre, projecting into the cavity of thorax, being concave forwards longitudinaly;

(2.) **Heads of the Ribs**—lodged in the SOCKETS formed by the Half-facets on the side, of the Bodies of the Vertebræ, (and attaching ligaments);

Interarticular L.

(3.) **Row of the Necks of the Ribs**—interposed between—and in front of—the Transverse Processes of the Dorsal Vertebræ, the first two being narrow and the last two absent, while the rest being wider than the shafts;

(4.) **Thoracic Grooves**—or concavities, by the side of the Spinal Column, formed by the sudden curving of the ribs at their Tubercles; being narrow above, wide below and deep in the middle, (for receiving the thick border of the Respiratory Organs):

The Lungs.

3 & 4. *LATERAL REGIONS*—also concave, presenting the—

(1.) **Smooth Inner Surface of the Ribs**—(attaching muscles and) marked with the Grooves, at their lower border (for lodging vessels and nerves); and separated by the—

Infracostalis M. Intercostal A. V. & N.

(2.) **Intercostal Spaces**—(closed up by a series of muscles, in the recent state.)

Internal Intercostal M.

Apertures—also two; of which the—

Superior—is small and heart-shaped, being transversely long, and inclined from behind, downwards and forwards; (is traversed by the Food and Air-passages, besides muscles, vessels, and nerves;) and is bounded by a—

The Œsophagus & the Trachea. Longi colli, Sterno-hyoid &-thyroid M. Carotid, Subclavian & gugular A. & V. Sympathetic, Phrenic & Pneumogastric N.

Circumference—formed by the—

Longi Colli M.

1. Body of First Dorsal Vertebra—projecting behind (and attaching muscles);

Anterior & middle Scalenus M.

2. First rib—on the sides, (attaching another pair of muscles);

Sterno-mastoid, -hyoid &-thyroid M.

3. Manubrium—in front, (attaching a third set of muscles):

Inferior—is very large and oval, being transversely long, and is directed downwards and forwards; (is closed up, in the recent state, by a large muscle, transmitting vessels, nerves and the Food passage); and is irregular, presenting alternate Notches and Projections thus—

Diaphragm M. Aorta & Infr. Vena cava. Sympathetic N. & the Œsophagus.

1. Front Notch—deep and divided into two, by the Ensiform Appendix (attaching muscles):

Triangularis sterni Internal Oblique & Diaphragm M.

2. Lateral Eminences—on the sides, which are curved and formed by the united lower borders of the Cartilages of the last true and of the three false ribs, (attaching other muscles):

Diaphragm, Internal oblique & Transversalis M.

3. Posterior Notches—one on each side of the Spinal Column, and bounded by the last ribs externally, (attaching muscles):

Quadratus lumborum, Int. Oblique & Transversalis M.

4. Minor Notches—above the Eleventh and Twelfth Ribs, on each side (which are closed up by muscles).

Intercostal M.

Cavity of the Thorax—varies much in size, according to the movements of Respiration. It is wide and short in the female; is more extensive antero-posteriorly in the child; but is transversally so in the adult. It becoms invariable, with rigid joints, in extreme old age.

☞ The Capacity of the Thorax, indicating the Volume of the Lungs, shows the vigour and the muscularity of the individual.

Use.—To contain and protect the Vital Organs of Circulation and Respiration;—to give firm support to the Arms and to numerous muscles;—and to dilate and contract by the rise and fall of the moveable Ribs, with their Cartilages and the Sternum, especially below, for the purpose of pumping air—in and out of its cavity.

CHAPTER III.—THE SKULL—

A strong cabinet or room, that is balanced on the summit of the spring-cushion, formed by the vertebral column; and contains in it, the Brain and the Organs of Sight, Hearing, Smell and Taste. It is divided into—

I. THE CRANIUM—or cavity-portion, situated above and behind, and formed of SEVEN bones:

II. THE FACE—situated below and in front, and composed of FOURTEEN bones.

I. THE CRANIUM—

or the Cavity-portion of the Skull, which is formed of the—

CRANIAL BONES—seven in number; of which the—

I. MEDIAN—at the middle—or *SINGLE*—are three; thus—

1. **THE SPHENO-OCCIPITAL**—divided into the—
    1. OCCIPITAL—behind, situated at the back of the head;
    2. SPHENOID—in front, situated at the base of the Cranium:
2. **THE ETHMOID**—placed in front of the Sphenoid;
3. **THE FRONTAL**—situated in the front part of the head:

II. LATERAL—placed at the sides, and—*IN PAIRS*—are four; thus—

THE PARIETAL BONES—two—at the sides above;

THE TEMPORAL BONES—two—at the sides below, forming the base of the skull.

1. THE OCCIPITAL BONE-

Is a flat lozenge-shaped bone, so curved as to present a horizontal part below and a vertical part behind, the whole being concave forwards and upwards ; the lower and front part presenting a big hole, called the Foramen Magnum or the largest hole. It has—

Surfaces—two ; of which the—

Exterior—presents, from the summit downwards—

Occipito-frontalis M.

1. **A Smooth Surface**—(covered by a flat muscle throughout);

Ligamentum Nuchæ.

2. **The Exterior Occipital Tuberosity**—an eminence, situated half-way between the summit of the bone and the Foramen Magnum, (and fixing a strong ligament);

3. **The Superior Curved Lines**—ridges, one on each side, passing outwards from the Tuberosity, (and fixing muscles ; thus—

Occipito-frontalis M. | *Above*—one of the head;

Trapezius & Sterno-mastoid M. | *Below*—two of the neck):

4. **The Exterior Occipital Crest**—a ridge, passing from the Tuberosity to the Foramen Magnum ;

5. **Rough Depressions**—on the sides of the Crest, between the Superior and the Inferior Curved Lines (fixing muscles of the back of the neck;—

Complexus M. | *Inner part*—one ;

Splenius M. | *Outer part*—another):

6. **The Inferior Curved Lines**—ridges, one on each side, going outwards, from the middle of the Crest, (and, with the rough depressions in front, fixing muscles for erecting the head ;—

Large & Small Posterior Rectus M. | *Inner part*—two;

Superior Oblique M. | *Outer part*—a third):

Spinal Cord.
Vertebral A. & Spinal accessory N.

7. **The Foramen Magnum**—a large elliptical hole, long antero-posteriorly, having shelving borders, (and transmitting different structures;)

Odontoid L.
Lateral Rectus of Head M.

8. **The Occipital Condyles**—one on each side of the Foramen Magnum, being convex and nearer together in front, smooth below and rough within (for attaching a ligament), and tubercular externally (for attaching a muscle), each being bounded by the—

   1. **Anterior Condyloid Fossa**—in front, which is perforated by the—

      Hypoglossal N.

      ANTERIOR CONDYLOID FORAMEN—always existing, and running upward, backward and *inward*, to terminate at the margin of the Foramen Magnum (for transmitting a nerve);

Contd.—2. **Posterior Condyloid Fossa**—behind, perforated by the—

Posterior Condyloid Foramen—which is irregular and often wanting, running upward, forward and *outward*, to open into the Foramen Lacerum Posterius (transmitting an unimportant small vein):

9. **The Basilar Surface**—in front of the Foramen Magnum, being broad behind and marked with the—

1. **Pharyngeal Spine**—along the middle, (for fixing a muscular raphe);

Of the Pharynx M.

2—**Lateral Depressions**—on the sides, (for fixing muscles; —

Back part—two of the head;

Front part—one of the pharynx):

Large & Small Anterior Rectus M.
Sup. Constrictor M.

Interior—or **Cerebral** surface—is concave and smooth, presenting the—

1. **Interior Occipital Tuberosity**—situated in the middle, and opposed to the Exterior Tuberosity; having a Depression on its right side (to receive a veinous knot), and marking the meeting of—

The Torculor Herophili

2. **Three Sulci**—or **Grooves**; of which the—

1. **Longitudinal**—runs upwards to the Upper Angle, (lodging a vein in it and fixing a membrane by its edges);

Longitudinal Sinus V. & Falx Major Mb.

2 & 3. **Transverse** ones—run outward, one on each side, to the Lateral Angles (lodging another vein and attaching another membrane by the edges):

Transvrse Sinus V. Tentorium Cercbelli Mb.

3. **Interior Occipital Crest**—a ridge, passing from the Interior Tuberosity to the Foramen Magnum, dividing there into two branches, (and attaching a membrane throughout);

Falx Minor of Dura mater.

4. **Four Fossæ** of the Occipital, which are separated from each other by the three Sulci and the Crest; of these the—

1. **Cerebral Fossæ**—are the superior two, (protecting the hemispheres of the upper brain);

Cerebrum.

2. **Cerebellar Fossæ**—are the lower two, larger and smooth (to protect the lobes of the lower brain):

Cerebellum.

5. **Inner Mouth of the Foramen Magnum**—which is larger than the outer, and is situated in front of the Crest, showing on its sides the—

Inner Apertures of the Anterior Condyloid holes—(each transmitting a nerve);

9th or Hypoglossal N.

Contd.—**6. Basilar Groove**—in front of the Foramen Magnum and—on the **Basilar Process**, being broad and shallow, sloping gradually upwards and forwards, (and lodging the vital portion of the brain); *Medulla Oblongata.*

7. Upper Apertures of the Posterior Condyloid holes, lying quite at the margin of the bone, external to the Foramen Magnum, each being surmounted by a bony Arch (and transmitting a very small and unimportant vein);

8. A wide Half-Groove—on each side, along the margin, short, passing backwards from the Upper Opening of the Posterior Condyloid Hole, (and lodging a big vein): *Transverse Sinus V.*

9. A narrow Half-Channel—along each border of the Basilar Process, to form with the Petrous bone the—Inferior Petrosal Groove (for lodging a vein): *Inferior Petrosal Sinus V.*

Angles—four ; of which the—

Superior—is acute ;

Inferior—is truncated, presenting the—

Anterior Surface of the Basilar Process, quadrilateral and continuous, in the recent state, with the Body of the Sphenoid bone ;

Lateral angles are rough and obtuse, corresponding with the outer ends of the Transverse Sulci:

Borders—four ;—

Superior—two (one on each side), which are deeply denticulated, for articulation with the Parietal bone;

Inferior —two (one on each side), each presenting the—

1. **Jugular Process**—a smooth stout eminence, projecting outwards from the middle, dividing the border into two parts, and having —
   A square rough Surface—on the top, to articulate with the Petrous portion of the Temporal bone ;
2. **Upper portion** of the border—situated behind the Jugular Process, being toothed, for articulation with the Mastoid portion of the Temporal bone ;
3. **Lower portion**—situated in front of the Jugular process, presenting—from behind forwards—
   1. A Notch—to form with the Petrous bone the—Foramen Lacerum Posterius, being often divided into two by an Arch of bone ;
   2. The Margin of the Basilar Process—articulating by apposition, with the border of the Petrous bone, and forming with it the—Inferior Petrosal Groove (for supporting a vein). *Inferior Petrosal V.*

Structure—Cellular diploë, between two compact layers, called the INTERIOR and EXTERIOR TABLES; the interior, being hard and dense, is called the VITREOUS LAYER; while the exterior is tough and less dense. The bone is thick at the ridges and protuberances; but thin and semi-transparent at the fossæ.

[**Development**—in FOUR PIECES—**at birth**—around the Foramen Magnum, appearing in the 8th week of conception, even before the ossification of the Vertebræ; thus—

1. THE POSTERIOR PIECE—from FOUR POINTS, which unite before birth at the Tuberosity;

2 & 3. THE CONDYLOID PIECES—each from ONE POINT, uniting with the Posterior piece—at the **fourth year—after birth**;

4. THE BASILAR PIECE—from ONE POINT, uniting with the rest, at the—**sixth year** after birth.

Articulations—with the Parietal, Temporal, Sphenoid, and the Atlas.

---

2. THE SPHENOID BONE-

Is placed at the base of the Skull, like a wedge, articulating with all the other bones of the Cranium. It is divided into a BODY, two GREATER WINGS, two LESSER WINGS and two PTERYGOID PROCESSES: thus—

I. Body—is cuboid and continuous with the Basilar Process of the Occipital, having the—

A. Sphenoidal Sinuses—or hollows, that are open only in front, to communicate with the Nasal Fossæ: while below, they are closed up by the Sphenoidal TURBINATED BONES, which are thin curved plates, forming the lower walls of the Sinuses; the upper and back walls being formed of the Sphenoid itself:

B. Surfaces—six;—

I. Posterior—quadrilateral, for uniting with the Basilar Process of the Occipital, with which it is continuous:

II. Anterior—presenting the MOUTHS of the Sphenoidal Sinuses:

III. Lower—presenting—

1. **The Rostrum**—a ridge, along the middle, passing forwards and separating—

2. **Two Grooves**—each overhung by a LAMINA on its outer side, for binding the Wings of the Vomer bone:

3. **The Pterygo-palatine Grooves**—one on each side, situated still externally, and completed each by the Palate bone into a canal—the PTERYGO-PALATINE CANAL (for transmitting vessels):

Pterygo-palatine A. & V.

Contd. **IV. Superior**—or **Cerebral surface** presenting from behind forwards—

1. **The Dorsum Ephebii**—a square lamina, which is grooved as a continuation of the Basilar Groove (to receive a bridge of the brain), and notched on the sides (for the passage of nerves to the eye), and which terminates anteriorly as the—

   Pons Varolii.
   Third, Fourth and Sixth Cranial N.

   POSTERIOR CLINOID PROCESSES—one on each side (for attaching the roof of the lesser brain);

   Tentorium Cerebelli.

2. **The Sella Turcica**—or **Pituitary Fossa**—a hollow or depression (for lodging a portion of the brain);

   Pituitary body or G.

3. **The Olivary Process**—a round eminence, just in front of the Sella Turcica ;

4. **The Optic Groove**—a transverse channel, ending in the Optic Hole on either side (and receiving the crossing of a nerve) ;

   The Optic Commissure of Brain.

5. **A Smooth Surface**—which is horizantal, presenting the OLFACTORY GROOVES—two shallow longitudinal grooves (for lodging a pair of nerves),—and which is prolonged anteriorly, in form of the—

   Olfactory N.

   ETHMOIDAL PROCESS—in the middle—being thin, to articulate with the Ethmoid bone.

6. **The Cavernous Grooves**—are situated on either side of the Sella Turcica, being horizontal at the middle and bending downwards behind and upwards in front (for lodging vessels).

   Internal carotid A. & Cavernous Sinus V.

V. & VI. Lateral surfaces are smooth and uneven, each being marked by the Cavernous Groove at the upper part, and fixing the Greater Wings below and behind, and the Lesser Wings in front and above.

II. Greater Wings—are two, one on each side,

going outwards and upwards, each being prolonged behind and externally in form of the—

Spine of the Sphenoid—which fits into the receding angle, between the Petrous and Squamous portions of the Temporal bone, and projects downwards in form of a—

Spinous Process (to attach a muscle and a ligament).

Laxator tympani M.
Internal Lateral of Lower Jaw L.

Each Wing appears as if impressed, in its soft state, between the thumb and the next two fingers of the maker ; thus presenting—

Surfaces—three; of which the—

I. **Superior**—is large and concave (corresponding as if to the impression made by the thumb), and smooth (to support the brain), having—from the Spine, forwards and inwards—four FORAMINA; viz.:—

1. **The Foramen Spinosum**—an opening from below (transmitting an artery);

Middle Meningeal A.

2. **The Foramen Ovale**—a larger opening, going downwards (and transmitting a nerve towards the Lower Jaw);

Third division of the Fifth Cranial N.

3. **The Foramen Vesalii**—a very small and unimportant hole, (leading a minute vein downwards into the Pterygoid Fossa);

4. **The Foramen Rotundum**—a round opening, leading horizontally forwards (a nerve towards the Upper Jaw):

Second division of the Fifth N.

II. **Inferior**—is convex and curved (corresponding as if to the impression made by the middle finger in holding the Process while soft) and is divided into two portions, presenting—

1. **A Horizontal Ridge**—passing from behind forwards and dividing the surface into two portions;
2. **The Upper Division of the Surface**—situated above the Ridge and belonging to the TEMPORAL FOSSA, being large and furrowed (for some arteries), and concave antero-posteriorly (for attaching a muscle);

Deep Temporal A.
Temporal M.

3. **The Lower Division of the Surface**—situated below the Ridge, and belonging to the ZYGOMATIC FOSSA, being much smaller than the upper division (attaching a muscle), and presenting at the back part—

External Pterygoid M.

    1. THE LOWER ORIFICE of the OVAL FORAMEN;
    2. THE LOWER ORIFICE of the SPINOUS FORAMEN;
    3. THE POINTED SPINOUS PROCESS of the Sphenoid:

III. **Anterior**—called the **Orbitar Plate** of the Sphenoid—is smooth and small (corresponding as if to the impression made by the index finger of the maker) and is quadrilateral, being directed forwards and inwards, and forming the outer wall of the Orbit; having the—

1. **External Orbitar Foramina**—at the upper part, two—existing at times (and transmitting two small branches of an artery);

The Lachrymal & another of the Middle Meningeal A.

2. **Margins**—four; of which the—
    (1.) **Upper**—is serrated and broad, forming a rough TRIANGULAR SURFACE, to articulate with the Frontal bone;
    (2.) **Outer**—is only serrated, to articulate with the Malar bone;

Contd.— (3.) **Lower**—is rounded and smooth, to form the SPHENO-MAXILLARY FISSURE ;

A branch of the Ophthalmic A.

(4.) **Inner**—is sharp and smooth, to form the SPHENOIDAL FISSURE, and is notched (for the passage of an artery) :

Circumference—one (excluding the Outer and Lower Borders of the Orbitar Plate, and) consisting of four portions ; thus the –

1. **Inner Portion**—is what fixes the Wing to the Body ;
2. **Posterior Portion**—is free, extending from the Posterior Surface of the Body to the Spine, and is thick and divided into two subdivisions;—
    1. **The Inner half**—being smooth, to form the FORAMEN LACERUM MEDIUS, and subdivided into two portions, by an overhanging Angle of bone, situated above the Vidian hole;
    2. **The Outer half**—being rough, for articulation with the Petrous portion of the Temporal bone :
3. **Outer Portion**—runs from the Spine forwards and upwards and is divided likewise into two subdivisions;—
    1. **The Lower division**—extending from the Spine to the tip of the Wing, being concave, large and bevelled—internally below and externally above—, to join with the Squamous portion of the Temporal bone;
    2. **The Upper division**—situated right at the tip of the Wing, being very short and greatly bevelled within, to overlap the Anterior Inferior Angle of the Parietal bone:
4. **Anterior Portion**—is also divided into two subdivisions ;—
    1. **The Outer half**—serrated and broad, forming a rough TRIANGULAR SURFACE—at the upper margin of the Orbitar plate, to join with the Frontal bone;
    2. **The Inner half**—smooth, forming the inner boundary of the Orbitar plate, and going downwards and inwards to join the Body, thus forming the lower boundary of the—

SPHENOIDAL FISSURE—or the FORAMEN LACERUM ANTERIUS, which forms a communication between the cavity of the Cranium and that of the Orbit (for transmitting nerves) ; being triangular in form, with the base inwards made by the Body, the sides being formed by the separation of the Greater from the Lesser Wing of the Sphenoid.

Third, Fourth, Ophthalmic division of Fifth, & Sixth N.

III. Lesser Wings—are small, flat and triangular, being pointed externally, and broad internally, where they are joined together and to the Body ; each Wing having—

Two Roots—connecting its inner and lower part with the front part of the Body, and being separated from each other by—

The Optic Foramen—going forwards, outwards and downwards into the Orbit (and transmitting a nerve and an artery into the eye) :
Optic N.
Ophthalmic A.

The Upper Root—being thin, horizontal and continuous with the Body ;

The Lower Root—being thick and oblique, presenting—

Intl., Infr., & Extl. Rectus M. A TUBERCLE—in front, for attaching a common tendon (of three of the muscles of the eye) :

Surfaces—two ; of which the—

Superior—is smooth and large, belonging to the Interior of the Cranium ;

Inferior—is also smooth, but smaller, belonging to the roof of the Orbit, and forming the upper boundary of the Sphenoidal Fissure or the Foramen Lacerum Anterius :

Borders—three; of which the—

1. **Posterior**—is rounded, free and concave (corresponding to a fissure of the brain); *Sylvian Fissure.*
2. **Anterior**—is convex and serrated, being bevelled inferiorly to overlap the Frontal bone ;
3. **Inner**—is continuous with the front part of the Body of the bone;

Angles—three; of which the—

1. **Outer**—is thin and sharp ;
2. **Posterior**—is thick and blunt, forming the—
   ANTERIOR CLINOID PROCESS—arching over the Sella Turcica, and being opposed to the Posterior Clinoid Process of the side ;
3. **Anterior**—is continuous with the Ethmoidal Process.

IV. Pterygoid Processes—are two, one on each side, descending vertically downwards, from where the Greater Wings take their rise ; each Process presenting—besides the LATERAL SURFACES—

I. An Anterior Aspect—having the—

1. **Pterygo-maxillary Surface**—above, which is a small, smooth, triangular space, belonging to the PTERYGO-MAXILLARY FOSSA, and presenting the—
   1. **Anterior Aperture of the Vidian Canal**—which Canal passes through the base of the Process, from before backwards, (transmitting nerve and vessels); *Vidian N., A. & V.*
   2. **Anterior Aperture of the Foramen Rotundum**—lying above and externally to the Vidian Opening (and transmitting a nerve) : *Superior Maxillary N.*

Contd.— 2. **A Rough Margin**—to join with the Vertical Plate of the Palate bone, at times touching even the Posterior Border of the Superior Maxillary bone ;

3. **A Cleft**—below, into which the Tuberosity of the Palate bone is received :

II. A Posterior Aspect—presenting the—

Pterygoid Fossa—a deep excavation, along the whole length of the Process, (which is filled with a muscle,) dividing the process into TWO LAMINÆ or PLATES, of which the—

Intl. Pterygoid M. |

External Lamina—is broad, short and turned outward, having—

Surfaces—two ;—

Outer—rough, belonging to the ZYGOMATIC FOSSA (and attaching a muscle);

Extl. Pterygoid M. |

Inner—belonging to the PTERYGOID FOSSA (and attaching another muscle):

Intl. Pterygoid M. |

Internal Lamina—is narrower, longer and quite vertical, having the—

Outer Surface—belonging to the PTERYGOID FOSSA, smooth (and covered by a muscle);

Circumflexus Palati M.

Inner Surface—also smooth, but belonging to the outer wall of the NASAL FOSSA ;

Posterior Edge—sharp and free, forming the outer boundary of the Posterior Aperture of the Nasal Fossa, and presenting—from below upwards—

1. THE HAMULAR PROCESS—a hook-like elongation, curving outwards from the tip of the Internal Pterygoid Plate (round which the tendon of a muscle is turned) ;

Circumflexus Palati M.

2. A FREE BORDER—smooth and long, extending from the tip to near the base of the Lamina (and attaching a muscle of the Pharynx) ;

Superior Constrictor M. |

3. THE SCAPHOID FOSSA or DEPRESSION—at the upper part (for attaching another muscle) ;

Circumflexus Palati M.

4. THE POSTERIOR APERTURE OF THE VIDIAN CANAL—situated above and external to the Scaphoid Fossa, (transmitting a nerve with vessels right *through* the root of the Pterygoid Process forwards.)

Vidian N. A. & V. |

Structure—cellular where thick, compact elsewhere.

Development—in THREE PIECES **at birth,** which unite with each other, in the first year after birth ;—

Lateral Pieces—two, one on each side, for the Greater Wing and Pterygoid Process, formed each of TWO PORTIONS ;—

OUTER PORTION—large, for the Greater Wing and External Pterygoid Plate, from ONE POINT, appearing about the Foramen Rotundum, in the SECOND MONTH of conception, soon after the commencement of ossification in the Occipital bone;

INNER PORTION—small, for only the Internal Pterygoid Plate, also from ONE POINT, uniting with the main portion about the MIDDLE PERIOD OF GESTATION :

Central Piece—one, for the Body and Lesser Wings, formed likewise of TWO PORTIONS ; thus—

ANTERIOR PORTION—for the Lesser Wings and *front* part of the Body, from usually TWO POINTS for each side, appearing in the SECOND MONTH of conception, one on either side of each Optic Hole ;

POSTERIOR PORTION—for the *posterior* part of the Body, out of only TWO POINTS, appearing at the bottom of the Sella Turcica, about the time of ossification of the Lateral Pieces, and uniting in the FOURTH MONTH of gestation; but joining with the Anterior Portion towards the end of that period.

The **Turbinated bones**—appear about the end of the THIRD YEAR **after birth,** and join the Body of Sphenoid in from TEN to TWENTY years.

Articulations—with the ETHMOID, FRONTAL, PARIETAL, TEMPORAL and OCCIPITAL bones; also with the VOMER, SPHENOIDAL TURBINATED, PALATE and MALAR bones; and sometimes with the UPPER MAXILLARY too.

3. THE ETHMOID BONE-

Is light and cubical, being placed in the front part of the base of the Cranium, and consists of—

I. A Horizontal or **Cribriform Plate**—which fills up the Ethmoid Notch of the Frontal bone, and presents—on the upper aspect—

1. The Crista Galli—a triangular crest-like process of bone, rising from the middle of the upper aspect, and having—

Borders—three ; of which the—

LOWER—is fixed, as the base or root of the process ; while the other two are free, the—

ANTERIOR—being vertical, to articulate with the Frontal bone ; the—

SUPERIOR—slanting, from behind upwards and forwards, (and attaching a membrane):

Falx major. |

Contd.—**2. The Olfactory Grooves**—two—one on each side of
Olfactory N. | the Crista Galli, (lodging nerves and) having—

1. **The Olfactory Holes**—several (for transmitting the
Olfactory N. | branches of the same nerves);

2. **A Fissure**—in the front part, which is continuous
Nasal branch of | with—

3. **A Groove**—passing outwards, (both lodging a peculiar
Ophthalmic N. | branch of a nerve):

II. A Vertical Plate—which descends, from the Lower Aspect of the Horizontal Plate (as the Crista Galli ascends from its upper Aspect), vertically in the median plane, forming the Septum of the Nose, and cutting the Horizontal Plate at right angles, and having—

Borders—four ; of which the—

1. **Upper**—is fixed to the Cribriform Plate, and forms a continuation, as it were, of the Crista Galli ;
2. **Lower**—slopes downwards and forwards, to articulate with the Vomer bone ;
3. **Posterior**—corresponds with the Septum of the Sphenoidal Sinuses, with which it articulates ;
4. **Anterior**—is divided into two portions;—
   - UPPER—small, sloping *forwards* and downwards, to join with the Spine of the Frontal bone above and the Crest of the Nasal bones below ;
   - LOWER—large, sloping downwards and *backwards*, to attach the Triangular Cartilage of the Nose :

Surfaces—two—**Lateral**—which are marked with Grooves
Olfactory N. | and Holes (for receiving the branches of a nerve):

III. Lateral Masses—which are two cubical lumps of SPONGY BONE, suspended, one on each side, from the outer margin of the Cribriform Plate, as the Vertical Plate is from its middle : Each Mass having—

A. Cells—that are called the ETHMOID CELLS, which are numerous, and divided into two sets ;—

1. **The Posterior Set**—being fewer and smaller, opening into the Upper Passage of the Nose below and into the Sphenoidal Sinus behind ;
2. **The Anterior Set**—being larger and more numerous, having the INFUNDILULUM—as one, to communicate with the Frontal Sinus above, and the Middle Meatus of the Nose below :

B. Surfaces—two ; of which the—

1. **External**—called the **Os Planum**—is plane and contributes to the Inner Wall of the Orbit ;

Contd.—2. **Internal**—is irregular and rough, presenting two CURVED PLATES—with the concavity outwards ; thus—

1. THE SUPERIOR TURBINATED BONE—at the upper and back part, overhanging a groove—called the SUPERIOR MEATUS of the Nose, into which the Posterior Ethmoid Cells open ;
2. THE MIDDLE TURBINATED BONE—twice as large, and situated in front and below, overhanging the MIDDLE MEATUS of the Nose, where the Anterior Ethmoid Cells open :

C. Borders—four, which are broad, forming SURFACES—with **Half-Cells**, that are completed by the adjoining bones; thus—

1. **The Posterior**—corresponds with the Sphenoidal Turbinated bone of the side, through which the posterior Ethmoid Cells communicate with the Sphenoidal Sinus ;
2. **The Inferior**—is opposed to the Upper Maxillary before and the Palate bone behind, and these, when articulated, complete the Ethmoid Cells at the lower part ;
3. **The Anterior**—articulates with the Lachrymal bone, which completes the Cells there ;
4. **The Superior**—lies immediately external to the Cribriform Plate, and presents—
   1. HALF-CELLS—several, which are large and are completed by the Frontal bone ;
   2. **Half-Canals**—or Grooves—two, passing outward and backward, to form—when completed by the Frontal bone—

      THE INTERNAL ORBITAL CANALS ; of which the—

      1. ANTERIOR —is continuous with the Fissure by the side of the Crista Galli (and transmits like it a particular nerve); the— *Nasal branch of Ophthalmic N.*
      2. POSTERIOR — (transmitting an unimportant small artery and vein).

Structure—of compact tissue.

Development—in TWO PIECES—as the Lateral Masses—**at birth** ; these begin at the FIFTH MONTH OF GESTATION later than any of the other bones of Cranium.

The central CRIBRIFORM PIECE appears in the first year after birth.

☞The Ethmoid is solid and cartilaginous in children.

Articulations—with the SPHENOID and FRONTAL, NASAL and LACHRYMAL, UPPER MAXILLARY and PALATE, VOMER and INFERIOR TURBINATED ; and at times with the SPHENOIDAL TURBINATED too.

4. THE FRONTAL BONE-

Is placed in the front part of the Head, consisting of two portions, joined at right angles to each other ; and has—

Surfaces—two ;—

- **A. Exterior**—consisting of two portions ; thus—
  - *I. The Vertical portion*—presenting—
    - *A. ALONG THE MIDDLE*—
      - **1. A Vertical Suture**—above, existing only in the child ;
      - **2. The Nasal Notch**—below, to articulate with the Nasal bones in the middle, and the Nasal Process of the Upper Maxillary bone on each side, and being surmounted by—
      - **3. The Nasal Eminences**—two, one on each side of the median line, showing the situation of the—
        - **Frontal Sinuses**—which are two cavities, absent in children and gradually developed by age, extending in the adult to some distance between the inner and outer tables of the Vertical Plate, and communicating with the Middle Meatus of the Nose through the Infundibulum of the Ethmoid:
    - *B. ON EACH SIDE*—
      TWO ASPECTS—thus—
      - **I. The Front Aspect**—presenting from above downwards—
        - 1. **A Smooth Surface**—(covered by a muscle) ; *Occipito-frontalis M.* |
        - 2. **The Frontal Protuberance**—a broad but slight eminence, situated about the middle of the bone ;
        - 3. **The Supra-ciliary Ridge**—a curved ridge, continuous with the Nasal Eminence towards the median line ;
        - 4. **The Supra-orbital Arch**—forming the lower limit of the Vertical Portion and the anterior margin of the Orbitar Plate, and presenting the—
          - 1. SUPRA-ORBITAR NOTCH—or HOLE in some cases, in its inner half (transmitting vessels and nerves); *Frontal A., V., & N.* |
          - 2. ANGULAR PROCESSES—at the ends, which are serrated for articulation ; thus—
            - (1.) THE EXTERNAL—thick and prominent, and articulating with the Malar bone ;
            - (2.) THE INTERNAL—thin, and articulating with the Lachrymal bone :

Contd.—**II. Lateral Aspect**—presenting—from above downwards—

Temporal F. |

1. **The Temporal Ridge**—which is curved, running upward and backward from the External Angular Process, (fixing a fascia and) separating the Lateral from the Front Aspect;

Temporal M. |

2. **The Temporal Portion** of the bone—belonging to the Temporal Fossa and situated below and behind the Temporal Ridge (and giving origin to a muscle):

II. The Horizontal Portion—directed downwards, presenting—

A. ALONG THE MIDDLE—

1. **The Ethmoid Notch**—an oblong open space, bounded laterally by—

Nasal branch of the Opthalmic Division of the Fifth N. |

A Serrated Margin—with HALF-CELLS and two HALF-GROOVES—corresponding with those on the Lateral Masses of the Ethmoid—and forming with them the INTERNAL ORBITAR CANALS—(the anterior of which transmits a nerve);

2. **The Nasal Spine**—situated in front and articulating with the Crest of the Nasal' bones before and the Vertical Plate of the Ethmoid bone behind, and being bounded on the sides by the—

Apertures of the Frontal Sinuses—communicating with the anterior Ethmoidal Cells through the Infundibulum:

B. ON EACH SIDE—& EXTERNALLY—

The Orbitar Vault—or the arched roof of the Orbit, having—

Lachrymal G. |

1. **The Lachrymal Fossa**—a depression at the front and *outer* part (for lodging a gland);

Superior Oblique M. |

2. **A Tubercle** or **Depression**—at the front and *inner* part (for fixing a pulley to deflect the tendon of a muscle):

B. Interior—also consisting of two portions ;—

I. The Vertical Portion—presenting—

A. ALONG THE MIDDLE—

1. **The Sulcus Longitudinalis**—a longitudinal groove (lodging a vein, and) terminating at— *Longitudinal Sinus V.*
2. **The Frontal Crest**—a median ridge at the lower part (attaching a membrane and) terminating at— *Falx major of dura mater.*
3. **The Foramen Cæcum**—a blind pit (for fixing a process of the same membrane): *Falx major.*

B. ON EACH SIDE—

1. **The Pacchionian Depressions**—along the side of the Longitudinal Groove (for lodging some peculiar bodies); *Pacchionian G.*
2. **The Cerebral Surface**—smooth and marked with the—
   Frontal Fossa—at the middle, which corresponds in situation with the Frontal Eminence on the Exterior Surface of the bone:

II. The Horizontal Portion—having the—

1. **Ethmoidal Notch**—at the middle, which is quadrilateral and is filled up by the Cribriform Plate of the Ethmoid ;
2. **Upper Aspect of the Orbitar Vault**—on each side, which is convex and irregular, forming the floor of the Anterior Fossa of the Cranium :

Circumference—presenting—

1. **A Horizontal Portion**—which is interrupted at the middle by the ETHMOIDAL NOTCH, and is beveled interiorly to be overlapped by the Lesser Wings of the Sphenoid ;
2. **A Vertical Portion**—which is thick and denticulated, being beveled interiorly above and exteriorly below, to articulate with the Parietal bones, and is limited below by—
3. **A Triangular Rough Surface**—on each side, which separates the Horizontal from the Vertical portion, and articulates with the similar Triangular Surface on the Greater Wing of the Sphenoid.

Structure—of the HORIZONTAL PORTION—thin and compact;—of the VERTICAL PORTION—cellular diploë within two (the inner and outer) layers of compact tissue.

Development—in TWO PIECES—**at birth** ; commencing at the Frontal Protuberances, even before the time of Ossification of the Vertebræ, and uniting immediately after birth.

Articulation—with the PARIETAL, SPHENOID and ETHMOID ; with the NASAL, SUPERIOR MAXILLARY and LACHRYMAL ; and also with the MALAR bones.

5. THE PARIETAL BONES-

Are two irregularly quadrilateral bones, situated at the upper and lateral parts of the Cranium ; each having--

I. Surfaces—two ; of which the--

Exterior—is convex and smooth, presenting from above downwards—

1. **The Parietal Protuberance**—at the middle, surmounting—

2. **The Temporal Ridge**—situated below, and curved
Temporal F. | (for fixing a fascia) ;

3. **The Temporal Surface**—belonging to the Temporal Fossa, and bounded above by the Temporal
Temporal M. | Ridge (and fixing a muscle) :

Interior—is concave and marked with CEREBRAL IMPRESSIONS and ARTERIAL FURROWS, presenting—

1. **The Middle Meningeal Groove**—passing upward and backward from the Anterior Inferior
Middle Meningeal A. | Angle (and lodging an artery) ;

2. **A Longitudinal Half-furrow**—along the Superior
Longitudinal Sinus V. | Border (for lodging a vein);

3. **Pacchionian Fossæ**—lying external to the Longitudinal Furrow (and lodging some peculiar
Pacchionian G. | bodies) ;

II. Borders—four ; of which the—

1. **Anterior**—is beveled—internally below, and externally above—to form with the Frontal bone the CORONAL SUTURE ;

2. **Superior**—is longest, straight and denticulated, to form with the opposite bone the SAGITTAL SUTURE ;

3. **Posterior**—is thick and denticulated, to form with the Occipital bone the LAMBDOIDAL SUTURE, and presents—

The Parietal Hole—at the upper part (to transmit a small
V. of Santorini. | vein) ;

4. **Inferior**—is divided into three portions; thus—

(1.) **Anterior Portion**—thin and straight, and beveled externally, to be overlapped by the Greater Wing of the Sphenoid ;

(2.) **Middle Portion**—concave and beveled externally, to be overlapped by the Squamous portion of the Temporal bone ;

(3.) **Posterior Portion**—thick and straight, and serrated, to articulate with the Mastoid portion of the Temporal bone :

III. Angles— four ;—

Superior—two ; of which the—

1. **Anterior**—is a right angle, being membranous in the child forming the ANTERIOR FONTANELLE ;
2. **Posterior**—is obtuse, corresponding to the junction of the Sagittal and Lambdoidal Sutures, and marking the position of the POSTERIOR FONTANELLE in the child :

Inferior—two, both presenting VASCULAR GROOVES on their inner aspect ; thus the—

1. **Anterior**—prolonged downwards between the Frontal and Temporal bones (to be overlapped by the Greater Wings of the Sphenoid), is marked interiorly by an ARTERIAL GROOVE ; *For the Middle Meningeal A.*
2. **Posterior**—is truncated and grooved interiorly by a TRANSVERSE SULCUS—which is continuous with the Horizontal Groove on the Occipital bone (and lodges a vein.) *Transverse sinus V.*

Development—from one point, at the Protuberance, appearing simultaneously with those of the Vertebræ.

Articulations—with the FRONTAL bone before and the OCCIPITAL behind, with the opposite PARIETAL above and the MASTOID and SQUAMOUS PORTIONS of the Temporal bone and the GREATER WING of the SPHENOID below.

THE WORMIAN BONES-

Are certain irregular bones, of variable form and size, which are found along the various sutures of the Cranium, chiefly about the Sagittal and the Lambdoidal. They are usually seen at the Upper Angle of the Occipital, the Anterior Superior and the Anterior Inferior Angle of the Parietal, and sometimes at the tip of the Great Wing of the Sphenoid; rarely in other situations too.

Their **structure** and **mode of articulation**—are like those of the other Cranial bones; and they are developed from separate points of ossification.

Their **use**—is questionable :—at times they serve as cramps between the different Cranial bones, to strengthen their union ; but at other times they are quite smooth, and may be confined to one bone alone. They exist in the globular heads of Turks, as well as in the elongated ones of Negroes.

THE TEMPORAL BONES-

Are two very complicated bones, situated on the sides and base of the Cranium; each bone consisting of THREE PORTIONS, which are separate in the child, but united as one piece in the adult. Of these the—

I. MASTOID PORTION—is situated at the outer and back part of the bone, having—

Surfaces—two; of which the—

I. Exterior—is rough, and peculiar in having the—

I. Mastoid Process—a large nipple-like projection, characteristic of the portion, and descending from its lower part; being situated behind the outer opening of the ear, and being slightly compressed laterally, presenting—

1. **A Base**—above, which fixes the process;
2. **A Free Border**—below, behind and in front—(for attaching muscles; thus—

Sterno-Mastoid M. | *Anteriorly*—one,

Trachelo-Mastoid & Splenius Capitis M. | *Posteriorly*—two);

3. **An Outer Surface**—which is free and subcutaneous;
4. **An Inner Surface**—which is free only at the lower part, presenting the—

Digastric M. | (1.) Digastric Groove—(which attaches a muscle);

Occipital A. | (2.) Occipital Groove—which is internal, running parallel to the Digastric Groove, along the line of attachment of the Process on the Outer Surface of the bone, (and transmitting an artery);

II. Mastoid Hole—which is irregular in its position (and transmits some unimportant vessels into the interior of the Cranium):

II. Interior—is smooth and irregular, presenting—

A Curved Groove—which is deep, going vertically upwards, along the line of junction of this portion with the Petrous portion, and becoming continuous first with the Groove on the Posterior Inferior Angle of the Parietal bone and then with the Transverse Groove on the Occipital (and lodging a vein):

Transverse Sinus V. |

Borders—two free, rough and serrated ;—

The Superior—articulating with the posterior of the three divisions of the Lower Border of the Parietal ;

The Posterior—articulating with the upper portion of the Lower Border of the Occipital, from its Transverse Angle to the Jugular Process.

Angle of the Mastoid Portion—is the meeting point of these two borders, and corresponds to the Outer Angle of the Occipital

II. SQUAMOUS—or **SCALE-LIKE PORTION**—is situated in the front and upper part of the bone, having—

Surfaces—two ; of which the—

Exterior—is convex and marked with arterial
Deep Temporal A. | impressions, and presents the—

I. Zygomatic Process—which is characteristic of the bone; springing from the lower and back part of this portion and passing at first transversely outwards, with its surfaces upper and lower, and then twisting forwards, having its edges upper and lower ; the whole Process presenting—

1. **Surfaces**—two ; of which the—
   - OUTER—convex, subcutaneous and short ;
   - INNER—cancave, and overhanging the Temporal Fossa ;
2. **Edges**—two ; of which the—
   - UPPER—(attaching a fascia) is longer and
     Temporal F. | more straight than the—
   - LOWER—which is short and curved (and
     Masseter M. | attaches a muscle) ;
3. **Anterior Extremity**—which is serrated for articulation with the Malar bone and is obliquely cut at the expense of the Outer Surface and of the Lower Border ;
4. **Two Roots**—which meet together at a Tuber-
   External Lateral L. of Lower Jaw. | cle at the bend of the process (for attaching a ligament) : of these—
   - (1.) THE ANTERIOR ROOT—is inferior and curves in front of the Glenoid Cavity, forming its anterior boundary, and then going forwards to become continuous with the Horizontal Ridge dividing the Temporal from the Zygomatic portion of the Outer Surface of the Greater Wing of the Sphenoid ;
   - (2.) THE POSTERIOR—passes upwards and subdivides into two branches ; of which the—
     - (1.) INFERIOR—curves downwards and backwards, to terminate at the Glasserian Fissure ;
     - (2.) SUPERIOR—curves upwards to become continuous with the Temporal Ridge ;

Contd.— **II. Temporal Ridge**—a curved prominent ridge, separating the Squamous from the Mastoid portion of the bone and becoming continuous above with the Temporal Ridge on the Parietal bone (and attaching like it a fascia) ;

Temporal F. |

III. Temporal Surface—situated in front of the Temporal Ridge, being convex and marked with Arterial Furrows (and attaching a muscle) ;

Deep Temporal A. |
Temporal M. |

IV. Glenoid Cavity—situated just below where the Temporal Ridge meets the Zygomatic Process ; being oval in shape and directed downwards, outwards and forwards ; and having the—

1. **Glasserian Fissure**—which leads into the Tympanum, and running horizontally inwards, divides the Glenoid Cavity into two portions;—
2. **Anterior Portion**—smooth and cartilaginous for articulation with the Condyleof the Lower Jaw ;
3. **Posterior Portion**—rough and non-articular, being formed by the Lower Surface of the Vaginal Process of the Petrous Portion, (and lodging a gland):

Parotid G. |

Interior—is concave and marked with cerebral impressions :

Borders—two—free and continuous with each other ;

The Upper—being curved and beveled at the expense of the inner surface, to overlap the middle portion of the Lower Border of the Parietal bone ;

The Lower—being thick and toothed, and alternately beveled, to join with the curved portion of the Circumference of the Greater Wing of the Sphenoid bone.

III. PETROUS PORTION—is the rocky or the hardest portion of the Temporal bone, going forwards, downwards and inwards between the Basilar Process of the Occipital and the Greater Wing of the Sphenoid ; and contains in it all the Internal Organs of Hearing ; being itself conical in form, with a slight twist upwards and forwards, so as to have its Anterior Surface looking forward, *upward* and *inward*—Posterior Surface looking backward, *upward* and *outward*—and Inferior Surface looking downward, *backward* and *inward*. This Petrous Portion has—

1. A Base—situated at the divergence of the Squamous from the Mastoid Portion of the bone; and having a triangular outline, the upper part of the triangle being concealed by those two portions, and the lower part presenting, about the centre, the—

† These 1†, 2† and 3†, together with the 4† in the next page, are the four bony divisions of the Auditory Apparatus.

Meatus Auditorius Externus—or Outer Passage of Hearing, an oval passage going inwards and 1† forwards—almost along the axis of the Petrous Portion, being slightly curved so as to be convex downwards, and having—

[**An Outer Opening**—oval, and open almost horizontally, presenting two margins ; thus the—

1. **Upper Margin**—formed by the upper branch of the Zygomatic Root, smooth and rounded ;
2. **Lower Margin**—formed by the Vaginal Process, and rough (to attach the Cartilage of the Ear) :

[**An Inner Opening**—also oval, but obliquely placed, in a direction inwards, *backwards* and UPWARDS, and encircled by—

[**A Grooved Ridge**—which (attaches a membrane *Tympanic Mb.* | and) separates the Meatus from the—

[**Tympanum**—or Drum of the Ear—otherwise 2† called the **Middle Ear**—which is a large cavity, of irregular form, containing the three little bones of hearing called respectively the Hammer, the Anvil and the Stirrup, and is situated just over the Jugular Fossa and behind the Carotid Canal, and has the Inner Wall very irregular with many prominences and holes leading into the—

[**Labyrinth**—or **Internal Ear**—which is situated between the Tympanum externally, and the Inter- 3† nal Auditory Meatus internally, and consists of three distinct portions ; thus the—

[1. **Vestibule**—or MIDDLE CHAMBER—a room in the middle, situated between the Tympanum and the INTERNAL AUDITORY MEATUS,—(containing *Auditory or the Portio Mollis of the 7th Cranial N.* | the main part of the nerve of hearing) ;

[2. **Semicircular Canals**—three hoop-like canals, situated behind the Vestibule, and opening into it by their two ends ;

[3. **Cochlea**—a SPIRAL DOUBLE-CANAL—situated in front of the Vestibule and external to the Internal Auditory Meatus—passing from the Vestibule towards the Tympanum, (and containing a fluid for conducting the vibrations of sound) :

II. Apex—or summit—which is situated

at the divergence of the Greater Wing of the Sphenoid from the Basilar Process of the Occipital, and is irregular and truncated, forming the outer and posterior boundary of the FORAMEN LACERUM MEDIUM, and presenting the—

Interior Orifice of the Carotid Canal—a Canal passing through the bone (and transmitting an *Internal Carotid A.* | artery) :

III. Surfaces—three; of which the—

Posterior—is continuous with the Interior Surface of the Mastoid Portion, and is marked with CEREBRAL IMPRESSIONS belonging to the Posterior Fossa of the Cranium, and presents the—

1. **Orifice of the Meatus Auditorius Internus**—a large rounded opening, situated about the middle, and leading into the—

Meatus Auditorius Internus—or Inner Passage of Hearing—a large smooth and rounded canal, passing directly outwards and terminating at— 4+

A Vertical Plate—at the bottom, which presents—

[1. A HORIZONTAL RIDGE—dividing it into an Upper small and a Lower large portion;

Auditory N. | [2. CRIBRIFORM HOLES—at the back part of each Portion, communicating with the Vestibule (and transmitting the branches of a nerve);

Of the Auditory N. | [3. A SMALL HOLE—at the front part of the Lower Division, (transmitting a nervous filament to the Cochlea);

[4. A LARGER HOLE—at the front part of the Upper Division, which is the inner opening of the—

Aqueductus Fallopii—a canal passing through the bone, from the bottom of the Internal Auditory Meatus, at first outwards and then bending downwards and backwards along the inner wall of the Tympanum, to open at the Stylomastoid Hole (for *Facial N.* | transmitting a big nerve):

2. **Orifice of the Aqueductus Vestibuli**—*i. e.* of the passage of the Vestibule—a small slit-like opening, situated just above and external to the opening of the Inner Passage of Hearing. It is covered by a triangular Plate of bone and is but the expanded orifice of the—

Aqueductus Vestibuli—a narrow channel, passing from this opening, through the bone, into the Vestibule, (and transmitting a minute vein);

3. **A depression**—between the two openings (for *Dura Mater Mb.* | attaching a membrane:

Anterior—is continuous with the Interior Surface of the Squamous Portion (an INDISTINCT SUTURE indicating the original union of the two), and is marked with CEREBRAL IMPRESSIONS belonging to the Middle Fossa of the Cranium, and presents from within outwards—

1. **A Notch**—or deficiency—near the Apex, made by the Carotid opening ;
2. **The Gasserian Fossa**—situated above and external to the Carotid Notch—(lodging a nervous ganglion) ; *Gasserian G. of the Fifth cranial N.*
3. **The Groove for the Hiatus Fallopii**—sometimes double, passing from below the Carotid Notch backwards and outwards to—
4. **The Hiatus Fallopii**—a short canal, opening about the middle of this surface, and leading (a nerve) from the bend of the Aqueductus Fallopii ; *Large Superficial Petrosal N. from the Facial.*
5. **An Eminence**—situated above and external to the Hiatus Fallopii, indicating the position of the—
   Superior Semi-circular Canal—one of the three bony canals belonging to the POSTERIOR DIVISION OF THE LABYRINTH :

Inferior—is very uneven and complex, and is altogether out-side the cavity of the Cranium, presenting from the summit backwards and outwards—in groups of two—

- **I. A Notch** and a **Rough Surface**—thus ; the—
  1. **Notch**—is in front and towards the Apex, to form the Foramen Lacerum Medium ;
  2. **Rough Surface**—is somewhat behind and external, being large and quadrilateral in shape (and attaching muscles) ; *Levator Palati & Tensor Tympani M.*
- **II. Two Holes**—one lying in front and a little to the outer side of the other—in a line almost at right angles to the length of the Process ; both are the lower apertures of passages through the bone, thus the—
  1. **Carotid Aperture**—large, round and situated in front,—leading into the—
     CAROTID CANAL—a canal, running through the bone, at first upwards, and then horizontally forwards and inwards, to appear at the Notch at the Apex (for transmitting an artery with nerves) ; *Internal Carotid A. Carotid plexus of the Sympathetic N.*
  2. **Cochleary Opening**—small, triangular and situated quite at the posterior border,—leading into the—
     AQUEDUCTUS COCHLEÆ—a canal, going upwards, backwards and outwards, into the inner canal of the Cochlea (and transmitting a minute vein into it) ;

Contd.—**III. Two Fossæ**—lying parallel to the Holes and—externally ; of which the—

1. **Glenoid Fossa**—is in front, forming the Posterior Portion of the Glenoid Cavity, and is formed by the Vaginal Process, (and lodges a gland) ; *Parotid G.*
2. **Jugular Fossa**—is behind, being irregular in form and size, (and lodges a vein) : *Internal Jugular V.*

IV. Two Processes—separating the two Fossæ ; thus the—

1. **Vaginal Process**—broad and plate-like, passing outwards and backwards, from the ANGLE OF SEPARATION of the Squamous from the Petrous Portion, towards the Mastoid Process, and dividing itself into two Laminæ at the middle of its course. Of these—
    - I. THE POSTERIOR LAMINA—is small and ridge-like, curving *backwards*, and forming as it were the outer boundary of the Jugular Fossa ;
    - II. THE ANTERIOR LAMINA—is large, forming a quadrilateral plate that is fixed as it were by its Posterior Aspect on the Front Border of this Surface, and therefore lies in front of both the Carotid Opening and the Jugular Fossa. It presents—
        1. A POSTERIOR SURFACE—which is fixed below and is curved at the upper part, forming the floor of the Meatus Auditorius Externus ;
        2. AN ANTERIOR SURFACE—free, quadrilateral and concave, forming the Glenoid Fossa (to support a gland) ; *Parotid Gland.*
        3. AN OUTER EDGE—free and curved—forming the lower boundary of the Opening of the External Auditory Meatus—and rough (for attaching the cartilage of the ear); *Auricular Cartilage.*
        4. AN INNER EDGE—also free, forming the line of separation between the Glenoid and Jugular Fossæ ;
        5. AN ANTERIOR EDGE — which curves upwards to meet the Root of the Zygomatic Process ;

        The Glasserian Fissure—separating the two, (and transmitting different structures into the Tympanum) ; *Laxator Tympani M. Chorda Tympani N. Anterior Tympanic A.*

Contd.—6. A POSTERIOR EDGE—which passes outwards and meets the Outer Border at—

AN ANGLE—situated just in front of the Mastoid Process and prolonged upwards along the back part of the Meatus Auditorius Externus ;

Auricular branch of the Facial N. | **The Auricular Fissure**—separating this angle from the Mastoid Process (and transmitting a nerve) :

Stylo-hyoid, Stylo-Glossus & Stylo-Pharyngeus M. Stylo-Hyoid & Stylo-Maxillary L. | 2. **Styloid Process**—posterior and pencil-like, rising from between the two Laminæ of the Vaginal Process, which form therefore a sheath as it were round its base. It is about an inch long and runs downwards, forwards and inwards (attaching muscles and ligaments); and is very irregular in its development.

V. A Hole and a **Rough Surface**—both behind the two Processes ;—

Facial N. | 1. **Stylo-mastoid Foramen**—round and small, and situated in front, between the Styloid and the Mastoid Process. It is the Lower Aperture of the Aqueductus Fallopii (and transmits the nerve that passes through that canal).

2. **Jugular Surface**—rough and square, and situated internal to the Stylo-mastoid Foramen but external to the Jugular Fossa, for articulation with the Jugular Process of the Occipital bone :

Borders—three ;—

Superior—long, even and marked by the—

Superior Petrosal Sinus V. | 1. **Superior Petrosal Groove**—along its whole length (for lodging a vein) ;

Third Cranial N. | 2. **Semilunar Depression**—near the Apex (for the passage of a nerve) ;

Posterior—second in length, uneven and divided into two halves ; thus—

Inner Half—rough, for articulation by simple apposition with the Basilar Margin of the Occipital bone, and marked by—

Inferior Petrosal Sinus V. | **Half the Inferior Petrosal Groove**—which is completed by the Half Groove on the Margin of the Basilar Process (for lodging a vein) ;

Contd.—**Outer Half**—smooth for an outlet, and presenting the—

Jugular Notch—at the position of the Jugular Fossa, for forming, with the Jugular Notch of the Occipital bone, the—

FORAMEN LACERUM POSTERIUS—which is generally divided into two parts by a sharp Angle of bone projecting at the middle of the Notch;

Glosso-pharyngeal, Pneumo-gastric and Spinal accessory N. | THE FRONT PART—being small and narrow (for transmitting nerves);

Internal Jugular V. | THE BACK PART—large (for transmitting the big vein of the head):

Anterior—also divided into two portions at a—

Retiring Angle—formed, for receiving the Spine of the Sphenoid bone, by the separation of the Lower Border of the Squamous Portion from this Border of the Petrous, and presenting—

Two Apertures—situated one above the other, and going outwards into the Tympanum, and opening exteriorly internal to the Spine of the Sphenoid;

Tensor Tympani M. | THE UPPER CANAL—(transmitting a muscle into the Tympanum);

THE LOWER CANAL—conducting air into the Tympanic Cavity, and forming the bony portion of the—

Eustachian Tube—a canal, formed partly of bone and partly of cartilage, and opening on one side into the upper part of the posterior aperture of the Nasal Fossa, and on the other into the Cavity of the Tympanum (for conducting air into it from the former :)

Inner Portion of the Anterior Border—is free for articulation with the Posterior Border of the Greater Wing of the Sphenoid;

Outer Portion—joined with the Squamous Portion by—

An Indistinct Suture—above; and—
The Glasserian Fissure—below.

Articulation—with the OCCIPITAL, PARIETAL and SPHENOID, as well as with the MALAR and LOWER MAXILLARY bones.

Structure—of the PETROUS PORTION—hard and dense ;
„ MASTOID—Cellular ;
„ SQUAMOUS—like other flat bones :

[**Development**—in THREE PIECES—**at birth** (besides the Styloid Process), which unite into one in the first year after birth ;—

I. **The Squamous Portion**—with the **Zygomatic Arch**—developed apparently from one point, that appears immediately after those in the Vertebræ ;

II. **The Petrous**—with the **Mastoid Portion**—formed from only one point (the latter being a mere prolongation of the former,) and the Mastoid cells developed after birth ;

III. **The Tympanic Bone**—or **ring**—which is incomplete at the upper part, and fixes the Tympanic membrane in a groove along its concavity :

> This Ring appears even before the ossification of the Petrous Portion, and **after birth** gradually extends outwards in the form of an annular *plate*, and so forms the External Auditory Meatus by its Upper Aspect, the Glenoid Fossa being also deepened by its Lower Surface :

The Styloid Process—appears late in gestation, and is also very late in uniting with the rest, sometimes remaining separate even permanently.

THE CRANIAL SUTURES—

Sutures formed by the Cranial bones are in all thirteen ; thus—

A. *On the top*—six ;—

I. **Single**—three ; of which the—

1. **Sagittal**—is arrow-like, and formed between the two Parietals, and extends along the middle line from the tip of the Occipital to the summit of the Frontal ;

2. **Coronal**—is at right angles to the Sagittal, extending transversely across the vault, from the top of one Greater wing to the other of the Sphenoid bone. It is limbous, being formed by the two Parietals with the Frontal, the latter overlapping at the top.

3. **Lambdoidal**—is also across the head, extending from the Angle of one Mastoid bone to that of the other, and is formed by the two Parietals with the Occipital bone, and is deeply denticulated ;

II. Lateral—three *on each side*—all formed by the Lower Border of the Parietal bone ;—

Squamous Sutures.

1. **Masto-parietal**—with the Upper Border of the Mastoid (it is denticulated) ;
2. **Squamous**—with the upper part of the Squamous portion, that overlaps the Parietal ;
3. **Spheno-parietal**—with the tip of the Greater Wing of the Sphenoid which also overlaps the Parietal.

B. At the Base—seven :—

I. Single—three,

1. **Basilar**—lying transversely between the Occipital and the Sphenoid ;
2. **Sphenoidal**—formed by the whole Anterior Border of the Sphenoid (its body and its wings), and therefore divisible into three portions ; thus the—
    1. **Central Portion**—is concave forwards and harmonial, extending from one External Angular Process to the other of the Frontal bone ;
    2. **Middle Portion of each side**—is formed by the Triangular Surface on the Greater Wing of the Sphenoid, with the External Angular Process itself of the Frontal bone, and is broad, triangular and denticulated ;
    3. **External Portion**—is squamous and formed by the top of the front border of the Greater Wing of the Sphenoid overlapping the Frontal bone :
3. **Ethmoidal**—is at right angles to the Sphenoidal Suture and forms the three sides of a parallellogram, and presents the Internal Orbital Canals on each side.

II. Lateral—four on each side ; thus—

A. BEHIND THE PETROUS BONE—two—

1. **The Mastoid**—formed by the Posterior border of the Mastoid Portion with the Posterior Division of the Inferior border of the Occipital bone. It is denticulated and usually presents the Mastoid Hole.
2. **The Petro-Occipital**—formed by the Anterior division of the Inferior border of the Occipital with the Posterior border of the Petrous. It is harmonial with a thin layer of cartilage interposed

B. BEFORE THE PETROUS BONE—two—

1. **The Petro-Sphenoidal**—formed by the Anterior Border of the Petrous with the Posterior Border of the Greater Wing of the Sphenoid—and harmonial;
2. **The Squamo-Sphenoidal**—which is limbous, the Sphenoidal Wing over-lapping the Lower border of the Squamous only at the back part.

THE CRANIUM IN GENERAL—

Is shaped an ovoid, that is large behind and flat on the sides and base. It is smooth above, and uneven below, where there is a number of holes and irregularities. The Cranium is comparitively larger in the fœtus, in males and in the Caucasian races. It is thicker at the ridges and in the barbarous people, It has—

Surfaces—two; of which the—

Exterior—is divided into four regions; thus the—

1. UPPER REGION—which is bounded by the Nasal Eminences and Supra-orbitar Arches—in front; Exterior Tuberosity and the Superior Curved Lines of the Occipital bone—behind; and a line, extending from the end of the Superior Curved Line, along the Temporal Ridge, to the External Angular Process of the Frontal bone—laterally;

This region is smooth and oval, (being covered by
Occipito-frontalis M. | a muscle and) presenting the—

1. **Three Sutures**—Lambdoidal, Sagittal and Coronal;
2. **Smooth Upper part of the occipital:**
3. **Even Vault of the Parietals**—with the—
Parietal Protuberance—on each side, and the
Parietal Holes—at the back;
4. **Vertical Portion of the Frontal**—with the—
Frontal Eminences—surmounting the—
Supra-ciliary Arches:

2 & 3. LATERAL REGIONS—which are bounded above—by the line passing from the External Angular Process of the Frontal, along the Temporal Ridge and the Superior Curved Line; and below—by a line passing from the External Angular Process of the Frontal, along the Zygomatic Arch, to the Mastoid Process and thence to the Occipital Tuberosity;

This region is irregularly elliptical in outline, being convex behind and concave in front, and presenting the—

1. **Sutures**—three—Spheno-Parietal, Squamo-Parietal and Masto-Parietal—in full;

   Coronal, Sphenoidal, Mastoid and Lambdoidal—only in part;

2. **Temporal Ridge**—a ridge, passing backwards and at first upwards from the External Angular Process of the Frontal, over its lateral aspect, and over the Parietal and Temporal bones, to bend down and terminate at the root of the Zygoma-
Temporal F. | tic Process, (and giving attachment to a fascia);

Contd.—**3. Temporal Fossa**—bounded in front, above and behind by the Temporal Ridge, and below by the Horizontal Crest on the Outer Aspect of the Greater Wing of the Sphenoid; presenting many grooves (for an artery and attaching a muscle);

Deep Temporal A.
Temporal M.

4. Mastoid Convexity—showing the—

1. Mastoid Process—in the middle,
2. Mastoid Hole—behind, and the
3. External Auditory Meatus—in front:

4. LOWER REGION—or BASE—which is bounded behind—by the External Occipital Protuberance and the Superior Curved Lines;
In front—by the Nasal Eminences and the Supra-orbitar Arches; and
Laterally—by a line passing from the Externac Angular Process of the Frontal, along the Zygomatil Arch, and across the Mastoid Process to the Superior Curved Lines of the Occipital;

This region is oval, uneven and convex; articulating with the bones of Face in front and with the Spine in the middle; and consists naturally of THREE DIVISIONS; thus—*

I. THE POSTERIOR or *OCCIPITAL DIVISION*—including all that lies behind the Foramen Magnum and presenting the—

1. Upper Curved Line—with the—

Ligamentum Nuchæ.

1. Exterior Tuberosity—in the middle, (attaching a ligament);

Occipito-Frontalis, Trapezius and Sterno-Mastoid M.

2. Superior Curved Lines—on the sides, (attaching each three muscles):

2. Crest Line—with the—

Ligamentum Nuchæ.

1. Exterior Crest—along the middle, (attaching a ligament);

Complexus and Splenius M.

2. Interlinear Spaces—on the sides (attaching muscles):

3. Lower Curved Line—with the—

Posterior Large Rectus & Superior Oblique M.

1. Inferior Curved Lines—(attaching each two muscles);

Small Posterior Rectus M.

2. Rough Spaces—in front of them (attaching other muscles):

---

*All arranged in threes.

Contd.— *II. THE MIDDLE*—or *SPINAL DIVISION*—extending from the posterior limit of the Foramen Magnum to the Basilar Suture, and consisting therefore of THREE ZONES; thus—

1. The Foramen Magnum Zone—somewhat broader in the middle and narrowing towards the Mastoid Process externally, and presenting the—

- (1.) **Horizontal Portion of the Occipital**—showing, from within outwards, the –
  - 1. **Foramen Magnum**—in the middle, leading into the Spinal Canal below (and transmitting several structures); *Spinal Cord with its Theca, Vertebral A. & Spinal Accessory N.*
  - 2. **Occipital Condyles**—(attaching ligament internally and muscle externally and) presenting the— *Odontoid L. Lateral Rectus M.*
    - ANTERIOR CONDYLOID FOSSA–and HOLE —in front (transmitting a nerve); *Ninth Cranial N.*
    - POSTERIOR CONDYLOID FOSSA—and HOLE—behind (transmitting a small vein);
  - 3. **Jugular Process**—articulating with the Petrous Portion of the Temporal:
- (2.) **Mastoid Suture**—passing backwards and outwards and often presenting the—
  - MASTOID HOLE—(transmitting a small vein);
- (3.) **Lower aspect of the Mastoid**—showing, from within outwards, the—
  - 1. **Occipital Groove**—(transmitting an artery); *Occipital A.*
  - 2. **Digastric Groove**—(attaching a muscle); *Digastric M.*
  - 3. **Tip of the Mastoid** Process—(attaching several muscles): *Splenius Capitis, Trachelo-mastoid & Sterno-mastoid M.*

2. The Basilar Zone—divided obliquely into THREE TRACTS by two lines of Suture, which meet together in front at the outer end of the Basilar Suture and go on diverging outwards and backwards; thus—

- (1.) **The Basilar Tract**—in the middle, showing the—
  - **Basilar Surface** of the Occipital—with its –
    - PHARYNGEAL SPINE—along the centre (attaching a muscular raphe); *Raphe of the Pharynx.*
    - ROUGH DEPRESSIONS—on the sides (attaching muscles): *Large & Small Anterior Rectus M.*

Contd.—

The Posterior Petrous Suture-Line—runs obliquely backwards and outwards, immediately external to the Basilar Process, showing the—

1. **Petro-Occipital Suture**—at the middle, which is harmonial ;

At this part the Carotid A. & the Vidian N. enter the Cranium.

2. **Foramen Lacerum Medium**—anteriorly, which is a space open in bones but closed up (with fibro-cartilage) in the recent state, having the—
   - Carotid Canal—opening into it from behind, and the—
   - Vidian Canal—opening into it from before ;

Glossopharyngeal, Pneumogastric and Spinal Accessory N.

Internal Jugular V. Posterior Meningeal A.

3. **Foramen Lacerum Posterius**—or the Jugular Hole—at the back part, which is divided into two portions by a little Angle of bone—
   - The Anterior Portion—being narrow, (for the passage of nerves) ;
   - The Posterior Portion—wide (for the passage of a large vein with a small artery) :

(2) **The Petrous Tract**—going obliquely backwards and outwards, on each side of the Basilar Tract, and presenting from before backwards—

1. *The Front Jugular Portion*—with the—

Tensor Tympani & Levator Palati M.

(1.) **Quadrilateral Rough Surface**—(attaching muscles) ;

The Opening of the Bony portion of the Eustachian Tube—lying immediately external ;

Internal Carotid A.

(2.) **Lower Opening of the Carotid Canal**—passing into the bone (and transmitting an artery) ;

The Vaginal Process—commencing just external, and showing the—

Parotid G.

Back part of the Glenoid Fossa--supporting a gland;

(3.) **Aqueductus Cochleæ**—on the Posterior Border of the Petrous, (transmitting a vein) ;

Jacobson's N.

The Lower opening of Jacobson's Canal—(transmitting a nerve into the Tympanum and) lying immediately external—and on—

Contd.—

2. *The Jugulo-Carotid Crest*—situated right accross the middle of the Petrous Portion almost at right angles with the Vaginal Process, separating the Carotid Opening from the Jugular Fossa and varying much in its development ;

3. *The External Jugular Portion*—with the—

    (1.) **Jugular Fossa**—formed partly by the Petrous and partly by the Occipital, and situated almost at the line of separation of the Middle or Basilar Zone from the Posterior or Foramen Magnum Zone, and perforated at the bottom by the Jugular Hole (transmitting vessels and nerves);

    Internal Jugular V.
    Posterior Meningeal A.
    Eighth pair of Cranial N.

    The Posterior or **Inner Plate of the Vaginal Process**—curving round it externally ;

    (2.) **Styloid Process**—(attaching muscles and ligaments) ;

    Stylo-hyoid,-glossus &-Pharyngeus M. stylo-hyoid, and -maxillary L.

    The Meatus Auditorius Externus—lying immediately external ;

    (3.) **Stylo-mastoid Foramen**—(transmitting a nerve) out through the Petrous Portion ;

    Facial N.

    The Auricular Fissure—lying immediately external (and transmitting a branch of the same nerve) :

    Auricular N.

The Anterior Petrous Suture-Line—passes backwards and more outwards, to become continuous with the Petro-Squamous Suture and presents the—

1. **Petro-Sphenoidal Suture**—in front or internally, which is grooved (for lodging a fleshy tube) ;

    Eustachian Tube.

2. **Opening of a Double-Canal**—going upwards and outwards between the Squamous and Petrous Portions, (the Upper lodging a small muscle of the Ear) ;

    Tensor Tympani M.

3. **Glasserian Fissure**—or the Petro-Squamous Suture, dividing the Glenoid Fossa into two parts and (transmitting different structures) ;

Contd.—

(3.) The Spheno-Squamous Tract—triangular, commencing as a point from the margin of the Pterygoid Process and enlarging outwards and backwards, and presenting—

1. *The Sphenoid Angle*—or the back part of the Lower Surface of the Greater Wing of the Sphenoid, showing, from before backwards and outwards, the—

   (1.) **Foramen Ovale**—just behind and external to the External Pterygoid Plate (transmitting a big nerve) ; *Lower Maxillary N.*

   (2.) **Foramen Spinosum**—lying just external to the Eustachian Opening (and transmitting an artery) ; *Middle Meningeal A.*

   (3) **Spinous Process**—(attaching a ligament and a muscle) : *Internal Lateral L. of Lower Jaw. Laxator Tympani M.*

2. *The Squamo-Sphenoid Suture*—passing forwards to become continuous with the Squamous Suture :

3. *The Zygomatic Portion of the Squamous*—showing the—

   (1.) **Glenoid Cavity**—the anterior part of the Glenoid Fossa—which is articular and lies in front of the Glasserian Fissure, to articulate with the Lower Jaw ;

   (2) **Zygomatic Tubercle**—lying in front and without (and attaching a ligament) ; *External Lateral L. of Lower Jaw.*

   (3.) **Zygomatic Roots**—bounding the Glenoid Cavity ; thus—

   POSTERIOR ROOT—going backwards, external to the cavity;

   ANTERIOR ROOT—coming inwards in front of the cavity :

3. *The Basilar Suture Line*—existing only in the child ; but a *TRANSVERSE LINE* can always be made out, passing across that part of the Skull and along the Anterior Zygomatic Root, separating the Middle or Spinal Division from the Anterior or Facial Division—and showing from within outwards—

1. **The Basilar**—or **Spheno-Occipital Suture**—in the middle ;

Contd.—
Superior Constrictor M. | 2. **The Edge of the Pterygoid Process**—(attaching the muscles of Pharynx);

3. **The Anterior Root of the Zygomatic Process**—coming inwards towards the Basilar Suture, from the Zygomatic Tubercle:

III. THE ANTERIOR—or *FACIAL DIVISION*—which is also sub-divided into THREE ZONES; thus—

I. The Sphenoid Zone—presenting from within outwards—

(1.) The Body of the Sphenoid—in the middle, with its—

1. **Rostrum**—along the centre;
2. **Turbinated bones**—on the sides, below and in front;
3. **Laminæ**—with the—
   PTERYGO-PALATINE GROOVES—still externally;

(2.) The Pterygoid Process—descending on the sides and showing—

1. At the back part—
From above downwards—

Vidian N. & A. | (1.) **The Opening of the Vidian Canal**—(transmitting a nerve with an artery) through its base;

Circumflexus Palati M. | (2.) **The Scaphoid Depression**—at the root of the Inner Plate (attaching a muscle);

Internal Pterygoid M. | (3.) **The Pterygoid Fossa**—(separating the two plates and filled with a muscle);

2. At the lower part—
From within outwards—

Circumflexus Palati M. | (1.) **The Hamular Process**—passing backwards from the tip of the Inner Plate (and deflecting the tendon of a muscle);

(2.) **The Pterygoid Notch**—at the divergence of the two Plates, to receive the Tuberosity of the Palate bone;

(3.) **The thin Lower Border of the Outer Plate**—passing outwards and backwards and articulating with the Tuberosity of the Palate bone;

Contd.—

3. *At the front part*—
From below upwards—

(1.) **The Anterior Border**—of the Pterygoid Process—rough and serrated, for articulation with the Vertical Plate of the Palate bone;

(2.) **The Pterygo-maxillary Surface**—of the Pterygoid, smooth and triangular, belonging to the Pterygo-maxillary Fossa and showing the—

Vidian N. & A. | ANTERIOR OPENING OF THE VIDIAN CANAL—(transmitting a nerve and an artery) through the base of the Process;

Upper Maxillary N. | (3) **The Outer Opening of the Foramen Rotundum**—at the base of the Pterygo-maxillary Fossa (transmitting a big nerve);

(3.) **The Zygomatic Tract**—or Surface—separated from the Temporal Surface by the HORIZONTAL CREST on the Squamous and on the Greater Wing of the Sphenoid, and showing the—

External Pterygoid M. | 1. **Zygomatic Surface of the Sphenoid**—consisting of the Outer Surface of the Outer Pterygoid Plate and the Lower part of the Outer Surface of its Greater Wing, lying below the Horizontal Crest; (the whole giving attachment to a muscle);

2. **Lower Portion of the Squamous Suture**—passing upwards and outwards;

Masseter M. | 3. **Zygomatic Process**—passing forwards from the Tubercle at the base, and forming the outer boundary of the Temporal and Zygomatic Fossæ (and attaching a muscle by its Lower Border);

ITS ANTERIOR ROOT—sending an—
ANTERIOR BRANCH—forwards to become continuous with the Horizontal Crest on the Squamous and on the Greater Wing of the Sphenoid, separating the Zygomatic from the Temporal Fossa:

Contd.— 2. *The Ethmoid Zone*—presenting from within outwards—

(1.) **The Lower Aspect of the Ethmoid**—in the middle, with its—

1. **Vertical Plate**—along the centre, having the—
   For the Olfactory N. OLFACTORY GROOVES—on its surfaces;
2. **Nasal Grooves**—on each side, forming the Roof of the Nasal Fossæ, and presenting the CRIBRIFORM HOLES, and being bounded externally by the—
3. **Lateral Masses**—with their—
   - (1.) TURBINATED BONES—SUPERIOR and MIDDLE—overhanging the—SUPERIOR and MIDDLE MEATUSES of the Nose;
   - (2.) HALF-CELLS—completed by the Upper Maxillary, Palate and Lachrymal bones; and—
   - (3.) OS PLANUM—forming the Inner Wall of the Orbit;

(2.) **The Orbitar Vaults**—on each side, showing from before backwards—

1. **The Horizontal Plate of the Frontal**—with its—
   - *Nasal branch of the Ophthalmic N.* (1.) INTERNAL ORBITAR CANALS—two (the front of which transmits a nerve);
   - *Superior Oblique M.* (2.) ROUGHNESS—or Inequality—at the inner part, (for attaching a pulley to deflect the tendon of a muscle);
   - *Lachrymal G.* (3.) LACHRYMAL FOSSA—at the outer part (for lodging a gland);
2. **The Sphenoidal Suture**—formed by the Lesser Wing of the Sphenoid and the Orbitar Plate of the Frontal;
3. **The Lesser Wing of the Sphenoid**—with its—
   - *Optic N. & Ophthalmic A.* (1.) OPTIC HOLE—internally and above, (for transmitting a nerve and an artery);
   - *Common T. of Internal, External & Inferior Recti M.* (2.) TUBERCLE—on the Lower Root (of the Lesser Wing—for attaching a common tendon for three of the muscles of the Eye-ball); and—
   - *The Third, the Fourth, the Ophthalmic branch of the Fifth & the Sixth cranial N.* (3.) SPHENOIDAL FISSURE—or the FORAMEN LACERUM ANTERIUS—situated behind and below, separating the Lesser Wing from the Greater (and transmitting nerves)

Contd.—

(3) **The Orbitar Plate of the Greater Wing** of the Sphenoid—still externally, forming the Outer Wall of the Orbit, and presenting the—

Lachrymal A. & V. | *Malar N.* | External Orbitar Canals—(transmitting small vessels and nerve);

3. *The Frontal Zone*—formed by the Anterior Inferior Border of the Frontal, and presenting the—

(1.) **Nasal Notch**—with the—
Nasal Spine—at the middle—both articulating with the Nasal bones;

(2.) **Supra-Orbitar Arch**—on each side, with the—
Supra-Orbitar—or Super-Ciliary Notch—or Hole—situated a little internal to the middle (and transmitting vessels and nerve);

Frontal A. V & N. |

(3.) **External Angular Process**—of Frontal—articulating with the Malar bone.

Interior Surface—of the Cranium—consists of only two Divisions that are separated from each other by a line, passing round from the Foramen Cæcum to the Interior Occipital Protuberance: of these—

1. THE VAULT—or UPPER DIVISION, which is smooth, concave and marked with arterial and cerebral impressions, presenting—

For the Middle Meningeal A. |

1. *ALONG THE MIDDLE*—three—

(1.) **The Longitudinal Sulcus**—a smooth furrow, commencing behind from the Interior Occipital Protuberance and narrowing towards—

(2.) **The Frontal Crest**—in front, which is a raphe descending downwards and terminating above the Foramen Cæcum;

Lodging the Pacchionian G. |

(3) **Pacchionian Depressions**—on each side of the Longitudinal Sulcus:

2. *SUTURES*—three—

(1.) **The Sagittal Suture**—along the middle,

(2) **The Lambdoidal Suture**—across the back part; and—

(3.) **The Coronal Suture**—across the front part:

3. *FOSSÆ*—three, on each side—

(1.) **Cerebral Fossa of the Occipital**—behind;

(2.) **Parietal Fossa**—in the middle; and—

(3.) **Frontal Fossa**—in front:

Contd.—2. THE FLOOR—or LOWER DIVISION, which consists of Three Fossæ, lying on different levels, like a flight of steps; thus the—

1. *POSTERIOR FOSSA*—the lowest, being longest antero-posteriorly and deeply concave, and bounded in front by the Dorsum Ephippii in the middle—terminating at the Posterior Clinoid Processes. and the Superior Border of the Petrous Portion on the sides—presenting the Semilunar Depression internally (for lodging a nerve) and the Superior Petrosal Groove externally (for lodging a vein); and—

Fifth CranialN.

Superior Petrosal Sinus V.

(1.) *Being formed of—*

1. **Three Bones**—
    - (1.) **Occipital**—in the middle,
    - (2.) **Temporal**—on the sides, and—
    - (3.) **Parietal**—more externally;
2. **Three Sutures**—
    - (1.) **Petro-Occipital**—in front, supporting the—
      Inferior Petrosal Groove—(lodging a vein),
    - (2.) **Mastoid** or **Masto-Occipital**—behind and externally, and—
    - (3.) **Masto-Parietal**—more externally;
3. **ThreeDivisions**—(along the length)—
    - (1.) **Cerebellar**—belonging to the Occipital bone and divided into two Fossæ—for lodging the Cerebellum;
    - (2.) **Medullary**—forming the Foramen Magnum, and—
    - (3.) **Basilar**—forming the Basilar Groove and situated in front (for lodging a portion of the brain):

Inferior Petrosal Sinus V.

LodgingtheMedulla Oblongata.

Pons Varolii

(2.) *Presenting along the middle—*

1. **The Interior Occipital Crest**—(attaching a membrane) and separating the Cerebellar Fossæ from each other;
2. **The Foramen Magnum**—forming a communication between the Cranial Cavity and the Spinal Canal, and showing on its sides the—
   Interior Openings of the Anterior Condyloid Holes (transmitting nerves);
3. **The Basilar Groove**—(lodging some vital portions of the brain and) showing the Basilar Suture in the child, and terminating at the Dorsum Ephippii with the Posterior Clinoid Processes (attaching a mem rane):

Falx Cerebelli M.

Ninth Pair of Cranial N.

Medulla Oblongata & Pons Varolii.

TentoriumCerebelli

Contd.— (3.) *And having on each side—*

1. **Three Holes—**

Internal Jugular V. Glosso-pharyngeal, Pneumogastric and Spinal Accessory N.

(1.) **The Posterior Lacerated Hole**—divided into two parts (transmitting a vein and nerves) and showing the openings of the—
Mastoid and Posterior Condyloid holes—(transmitting small veins;

Auditory & Facial N.

(2.) **The Internal Auditory Meatus**—(transmitting two nerves and) situated just above the Posterior Lacerated Hole; and—

(3.) **The Aqueductus Vestibuli**—(transmitting a minute vein) and situated behind and below the Auditory Meatus;

2. **Three Sinuses—**

(1.) **The Lateral**—along the **Sulcus Transversalis**—which passes at first outwards from the Occipital Protuberane, and then grooving the Posterior Inferior Angle of the Parietal and the Mastoid Portion of the Temporal, curves over the Occipital again, to terminate at the Jugular Foramen;

(2.) **The Inferior Petrosal**—along the Petro-Occipital Suture, and supported partly by the Occipital bone, and partly by the Petrous Portion of the Temporal bone:

(3.) **The Transverse**—lying across the Basilar Process:

3. **Three Fossæ**—on each side—

(1.) **Cerebellar Fossa**—behind,

(2.) **Mastoid Fossa**—on the side—between the Mastoid and Petrous portions of the Temporal bone; and—

(3.) **A Depression**—in front, on the Petrous portion, situated behind and above the Internal Auditory Meatus (for fixing a membrane).

Dura Mater.

2. *MIDDLE FOSSA*—longest laterally, and marked with arterial and Cerebral Impressions; very narrow in the centre and expanding on the sides: and bounded in front by the Anterior Margin of the Optic Groove in the middle, and the Posterior Border of the Lesser Wing of the Sphenoid with the Anterior Clinoid Processes on the sides (attaching a membrane). It is—

For the Middle Meningeal A.

Folds of Dura Mater—forming the Cavernous Sinuses.

Contd.— (1.) *Formed of—*

1. **Three Bones**—
   - (1.) **Sphenoid**—in the middle,
   - (2.) **Temporal**—behind, and—
   - (3.) **Parietal**—on the sides;
2. **Three Sutures**—
   - (1.) **Petro-Sphenoidal**—at the back part,
   - (2.) **Squamo-Sphenoidal**—(with the SPHENO-PARIETAL) on the sides, and—
   - (3.) **Squamous**—more externally and above;
3. **Three Divisions**—
   - (1.) **Pituitary**—in the centre,
   - *Middle Lobes of the Brain.* (2.) **Right Lateral Fossa** } of the **Middle, Region**:
   - (3.) **Left Lateral Fossa** } Both being formed behind by the Anterior Surface of the Petrous Portion (showing the EMINENCE OF THE SUPERIOR SEMI-CIRCULAR CANAL), in front by the Greater Wing of the Sphenoid, and externally by the Squamous Portion and the Parietal:

(2.) *Presenting along the middle—*

1. *Pituitary Body.* **The Sella Turcica**—behind, overhung by the DORSUM EPHIPPII with the Posterior Clinoid Processes, (and lodging a peculiar body);
2. **The Olivary Tubercle**—at the middle;
3. *Optic Commissure and N.* **The Optic Groove**—in front (lodging a Commissure of the Brain with a nerve), and terminating at the—OPTIC HOLES on each side:

(3.) *And having on the sides—*

1. **The Lateral Aspect of the Body of the Sphenoid**—with the—
   - (1.) **Foramen Lacerum Medius**—at the back part;
   - (2.) *Cavernous Sinus V. Internal Carotid A.* **Cavernous Groove**—passing forwards from the Middle Lacerated Hole to below the Anterior Clinoid Process (and lodging a vein with an artery);
   - (3.) *Emissary V. of Santorini.* **Vesalian Holes**—lying somewhat externally (and transmitting nutrient veins into the Pterygoid Fossa);

Contd.—

2. **Forward Holes**;—commencing from the most anterior, and going one after the other—outwards and backwards—

(1.) **The Optic Hole**—leading into the Orbit (and transmitting the nerve of vision with an artery);

Optic N.
Ophthalmic A.

(2.) **The Sphenoidal Fissure**—or **Foramen Lacerum Anterius**—formed above by the Lesser and below by the Greater Wing of the Sphenoid, and internally by its Body and externally by the Orbitar Plate of the Frontal; being triangular and large (for transmitting several structures);

Third, Fourth, Ophthalmic division of Fifth and the Sixth N. & a small V.

(3.) **The Foramen Rotundum**—(transmitting a nerve) into the Pterygo-Maxillary Fossa:

Upper Maxillary N.

3. **Other Holes**—similarly placed one after the other—backwards and outwards from the Foramen Rotundum—

(1.) **The Foramen Ovale**—(transmitting a nerve) into the Zygomatic Fossa;

Lower Maxillary N.

(2.) **The Foramen Spinosum**—(transmitting an artery) which grooves the Middle Fossa, and going outwards divides into two branches, of which the—

Middle Meningeal A.

Posterior Groove—goes backwards, and the—

Anterior Groove—passes upwards and forwards across the Anterior Inferior Angle of the Parietal;

(3.) **The Hiatus Fallopii**—with the Double Groove—leading from the Foramen Lacerum Medius, (transmitting a nerve and an artery) into the Petrous bone;

Superior Petrosal or the Vidian N. & A.

3. ANTERIOR FOSSA—longest in the Median Line, and lying above and in front of the Lesser Wings, of the Sphenoid; being convex and—

(1.) Formed of—

1. **Three Bones**—

(1.) **Sphenoid**—behind,
(2.) **Ethmoid**—at the middle,
(3.) **Frontal**—in front and on the sides;

2. **Three Sutures**—

(1.) **Spheno-Ethmoidal**—at the middle
(2.) **Spheno-Frontal**—on the sides, and
(3.) **Ethmoidal**—in front;

Contd.—

3. **Three Divisions—**

   (1.) **The Olfactory Portion**—in the middle, formed by the Ethmoid (and supporting nerves);

   Olfactory N. & Bulbs.

   (2.) **The Right Anterior Fossa,**

   (3.) **The Left Anterior Fossa,** } Formed by the Orbital Plate of the Frontal and the Lesser Wing of the Sphenoid:

(2.) Presenting along the middle—

1. **The Ethmoidal Ridge**—and **Spine**—of the Sphenoid behind;
2. **The Crista Galli**—in front (attaching a membrane);

   Falx Major.
3. **The Foramen Cæcum**—above and in front of the Crista Galli, being formed between the Ethmoid and the Frontal bones, and communicating either with the Anterior Ethmoidal cells or with the Frontal Sinuses:

(3.) And having on the sides—

1. **The Olfactory Groove**—on the CRIBRIFORM PLATE of the Ethmoid (lodging and transmitting nerves through the Cribriform Holes);

   Olfactory N.
2. **The Internal Orbitar Canals**—two on each side, passing externally into the Orbit (the ANTERIOR being continuous with a SLIT by the side of the Crista Galli and transmitting a nerve);

   Nasal N.
3. **The Orbitar Roof**—formed by the Horizontal Plate of the Frontal and being convex and marked with cerebral impressions.

Cavity—is ovoid, being smaller before and continuous with the Spinal Canal below; it lodges the highest organ of the body.

Brain.

SIX TRANSVERSE LINES—along the *MIDDLE* or *SPINAL DIVISION* of the Base.—These are very important; as they can always be made out even in the living subject with ease. Each of these Lines includes five very important parts; and they are arranged thus:—

1. Three—in the Foramen Magnum Zone; —of these the—

(1.) **Mastoid Line**—passing, on either side, across the—

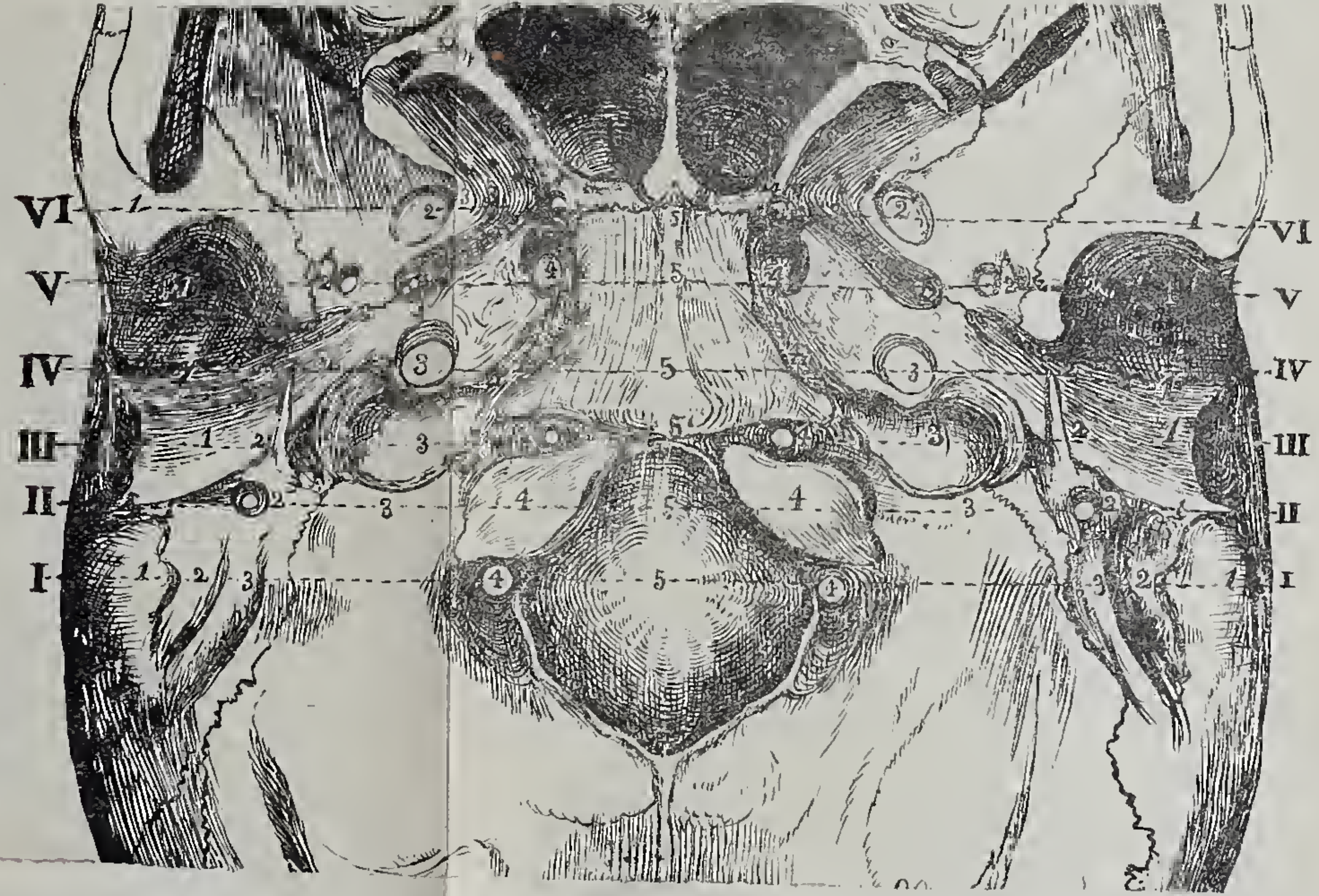
Splenius Capitis & Sterno-& Trachelo-Mastoid M.	1. Mastoid Process—(its centre),
Digastric M.	2. Digastric groove,
Occipital A.	3. Occipital groove,
A small V.	4. Posterior Condyloid Fossa and Hole,
Medulla Oblongata.	5. Centre of Foramen magnum;

(2.) **Posterior Auricular Line**—passing BEHIND THE EAR, and therefore on either side, through the—

Auricular from the Facial N.	1. Auricular Fissure,
Facial N.	2. Stylo-mastoid Foramen,
Rectus Lateralis M.	3. Jugular Process—(its middle),
	4. Occipital Condyle—(its middle),
Antero-lateral Tracts of the Cord.	5. Front Half of Foramen magnum;

(3.) **Auricular Line**—passing through the External Auditory Meatus, and therefore on either side, through the—

	1. Vaginal Process—(its Lower Edge);
Stylo-Pharyngeus M	2. Styloid Process,
Jugular V. and Eighth N.	3. Jugular Fossa,
Ninth N.	4. Anterior Condyloid Fossa and Hole,
Anterior Recti M.	5 Front Edge of Foramen Magnum;


VI
1
2
5
2
1
VI
V
1
2
3
4
5
4
2
V
IV
3
5
3
IV
III
1
2
3
5
3
2
1
III
II
2
3
4
5
4
3
2
II
I
1
2
3
4
5
4
3
2
1
I

Contd.— 2. *Two—in the Basilar Zone ;* of these the—

(1.) **Anterior Auricular Line**—passing immediately in front of the Ear, and therefore on either side, across the—

	1.	Glasserian Fissure,
Parotid G.	2.	Glenoid Fossa—(on the Vaginal Process),
Internal Carotid A.	3.	Carotid Canal—(its Lower Opening) ;
	4.	Petro-Occipital Suture,
Large Anterior Recti & Pharyngeal M.	5.	Basilar Surface—(its broad back part) ;

(2.) **Anterior Glenoid Line**—passing on either side, through the—

	1.	Condyle of Lower Jaw—on the Front part of the Glenoid Fossa,
Internal Lateral L. of Lower Jaw and Middle Meningeal A.	2.	Spinous Process—and the Foramen Spinosum of the Sphenoid,
For the Tensor Tympani M.	3.	Opening—of the (bony portion of the) Eustachian Tube,—and that of a Muscular Canal,
Internal Carotid A.	4.	Upper Opening of the Carotid Canal—and the Foramen Lacerum Medius,
Tensor Tympani & Levator Palati M.	5.	Narrow Front part of the Basilar Surface—with the Square rough Surface of the Petrous ;

3. *One—only in the Basilar Suture Line*—and may be called the—

Root Zygomatic Line—passing on either side, through the—

External Lateral L. of Lower Jaw.	1.	Tubercle of Zygoma—in front of the joint,
Lower Maxillary N.	2.	Foramen Ovale,
Vidian N. & A.	3.	Inner or Posterior Opening of the Vidian Canal,
Pharyngeal Constrictor Superior M.	4.	Posterior Edge of the Pterygoid Process,
	5.	Basilar Suture.

II. THE FACIAL BONES—

Are altogether FOURTEEN ; of which—

I. *LATERAL—in pairs* are *twelve,* SIX on each side ; thus the—

- **MALAR** and the— **SUPERIOR MAXILLARY** } externally,
- **NASAL** and the— **LACHRYMAL** } internally before,
- **PALATE** and the— **INFERIOR TURBINATED** } internally behind and below ;

II. *MEDIAN*—or *single* are *two ;* thus the—

- **VOMER**—above, and the—
- **INFERIOR MAXILLARY**—below :

THE HYOID bone—of the Neck -may also be grouped here, making the total FIFTEEN.

* * *

1. THE MALAR BONES—

Are flat bones, irregularly quadrilateral in shape, forming the prominence of the cheek, and presenting the—

I. Body—lozenge-shaped and placed vertically below the External Angular Process of the Frontal, having two Surfaces, four Angles and four Borders ; thus—

Surfaces—two, not looking exactly anterior and posterior or external and internal ; thus the—

Outer—is *anterior*—smooth and convex (being covered with a muscle and) presenting the—

Orbicularis Palpebrarum M.

Apertures of the Malar Canals--Canals which pass through the bone in different directions (transmitting vessels and nerves) ;

Inner—is *posterior*—presenting the—

1. **Articular Surface**—internally, which is triangular to articulate with the Malar Process of the Upper Maxillary ;
2. **Smooth Surface**—externally, which is concave and divided into—
   1. THE TEMPORAL PORTION—above and very concave and narrow ;
   2. THE ZYGOMATIC PORTION—below, wider and less concave, with the—
      APERTURE OF A MALAR CANAL—that passes forwards through the bone and divides into two branches, of which one opens on the Upper Surface of the Orbitar Process and the other on the Facial Aspect :

Angles—four ;—

Superior—thick and serrated, articulating with the External Angular Process of the Frontal ;

Anterior—thin and pointed, articulating with the Malar Process of the Upper Maxillary ;

Inferior—thick and obtuse and corresponding with the Malar Ridge of the Upper Maxillary ;

Posterior—oblique, prominent and denticulated, and articulating with the *Zygomatic* Process of the Temporal bone ;

Borders—four ; of which two are anterior and two posterior ; thus the—

Orbitar—is ANTERIOR and *superior*, being concave, smooth and rounded—forming part of the Circumference of the Orbit ;

Maxillary—is ANTERIOR but *inferior*, being rough and beveled externally to articulate with the Malar Process of the Upper Maxillary, which overlaps it here :

Temporal—is POSTERIOR and *superior*, being smooth and curved like an *f* ; and, forming part of the boundary of the Temporal Fossa, becomes continuous with the Temporal Ridge above and with the Upper Border of the Zygomatic Arch below, (and attaches a
Temporal F. | strong aponeurosis) ;

Zygomatic—is POSTERIOR but *inferior*, being thick and uneven ; and, forming part of the boundary of the Zygomatic Fossa, becomes continuous with the Lower
Masseter M. | Border of the Zygomatic Arch (to attach a big muscle) :

II. Orbitar Process

II. Orbitar Process—plate-like, and projecting backwards from the Orbitar Border, being therefore curved, having—

Surfaces—two ;—

Upper—or *Inner*—concave, smooth and contributing
Of the Malar branch of the Ophthalmic N. | to the Outer and Lower Walls of the Orbit, and presenting the ORIFICES OF ONE OR TWO MALAR CANALS (transmitting nervous filaments) ;

Lower—or *Outer*—smooth but convex, and belonging to the Temporal Fossa :

Borders—four ;—

Anterior—blended with the Orbitar Border of the Body ;

Superior—serrated and horizontal, articulating with the Frontal bone just behind its External Angular Process ;

Posterior—also serrated but vertical, to join with the Anterior Border of the Orbitar Plate of the Sphenoid ;

Inferior—or Internal—serrated and horizontal, and articulating with the Orbitar Plate of the Upper Maxillary ;

The Posterior Inferior Angle—which is sometimes free and smooth, forming the anterior limit of the Spheno-Maxillary fissure.

Articulations—with the FRONTAL, SPHENOID and TEMPORAL, bones; and also with the UPPER MAXILLARY.

[**Structure**—cellular diploë enclosed in two compact layers.

[**Development**—from a SINGLE POINT, that appears about the third month of gestation, when the Vertebræ ossify.

2. THE SUPERIOR MAXILLARY BONES–

Are two large and irregular bones, occupying the front and middle portions of the Face; each being of the form of a triangular prism, situated vertically—with the BASE towards the median plane and the TRIANGULAR FACES above and below, and presenting therefore five Surfaces—of which one (the Lower Triangular) is contracted into a thick Ridge,—and (in consequence) only five Angles (instead of six) and seven Borders (instead of nine);—besides four Processes, of which two are supported on two Angles and two on two Surfaces.

I. Surfaces—five, of which—

I. HORIZONTAL—are two, forming the Triangular Faces of the prism; of these the—

Superior—or **Orbitar**—is smooth and of a quadrilateral form, being encroached upon its outer part by the Malar Process; and is directed upwards, outwards and forwards, presenting the—

Infra-Orbitar Groove—passing along the middle forwards from the back part and gradually deepening to divide itself into two Canals; thus—

1. The Infra-Orbitar Canal—which is wide, and goes anteriorly to open at the Infra-Orbitar Hole in the Anterior Surface (transmitting vessels and nerve); *Infra-Orbitar A. V. & N.*

2. The Anterior Dentar Canal—which is narrow and goes downwards along the anterior Wall of the Maxillary Sinus (transmitting also vessels and nerves); *Anterior Dentar A. V. & N.*

Inferior—or **Alveolar**—is very narrow, the sides of this triangular face being as it were collected into a thick ridge-like Process called the—

Alveolar Arch—or **Process**—which is curved so as to meet the bone of the opposite side in front; which is thicker behind; and which has eight—

Alveoli—or SOCKETS FOR THE TEETH—that mark it both inwardly and outwardly with alternate furrows and eminences; of these the eminence for the Canine tooth is the most prominent:

II. *VERTICAL*—are three, forming the QUADRILATERAL SURFACES of the prism (representing the bone); each of these Surfaces presents three things; thus the—

Anterior—or **Facial**—which is irregular, looking outward and forward, presents the—

1. **Canine Ridge**—running vertically along its fore-part and getting more prominent below, and indicating the lodgment of the Canine tooth within;
2. **Infra-orbitar**—or **Canine Fossa**—situated behind this Ridge, and immediately below the margin of the Orbit, showing—

   Infra-orbitar A. V. & N.
   Levator Labii Superioris M. & Lev: Lab: Sup: alæque Nasi M.

   The Infra-orbitar Hole—which is the anterior opening of the INFRA-ORBITAR CANAL (transmitting vessels and nerve—with the Surface around it attaching a muscle above and another below);

   Depressor Labii Sup: alæque Nasi M.

3. **Myrtiform**—or **Incisive Fossa**—situated in front of the Canine Ridge, and immediately above the Incisor teeth (and giving attachment to a muscle);

Posterior—or **Zygomatic**—which is convex, looking backward and outward, presents the—

1. **Maxillary Tuberosity**—at its lower part, indicating the position of the last Molar tooth, and therefore more prominent before this comes out;

   Posterior Dental A. V. & N.

2. **Openings of the Posterior Dentar Canals**—two or three—at the middle (transmitting vessels and nerves);
3. **Inequalities**—at the back part below, for articulating with the Tuberosity of the Palate bone:

Internal—which is very irregular and complicated, presents the—

1. **Palatine Process**—which is a strong PLATE, projecting horizontally inward from the lower part in front, being thicker before than behind, and having—

   Surfaces—two;—

   Inferior—rough and concave antero-posteriorly—forming the Roof of the Mouth, and perforated with many nutrient holes, and having the—

   Posterior Palatine A. V. & N.

   POSTERIOR PALATINE GROOVE—or CANAL—running from behind forwards, along the outer side, (and transmitting vessels and nerves);

   Anterior Palatine A. V. & N. & the Naso-palatine Gn.

   ANTERIOR PALATINE NOTCH—at the front part internally, to form, when joined with the opposite bone, the lower orifice of a canal—called the Anterior Palatine or Incisive Canal—(for transmitting other vessels and nerves);

Contd.— **Superior**—smooth and plain from before backward, but concave from side to side, —forming the floor of the Nasal Fossæ, and presenting the—

Anterior Palatine A. V. & N. & the Naso-palatine Gn. | ANTERIOR PALATINE—or INCISIVE CANAL —in front and internally, descending forwards and inwards—to join the one of the opposite side, (and transmitting vessels and nerves):

Borders—four ;—

Outer—continuous with the rest of the bone;

Inner—thicker before than behind and rough, with—

1. A CREST—along its upper aspect, to form with that of the opposite side, a GROOVE—for receiving the Vomer bone ;
2. THE ANTERIOR PALATINE GROOVE,—inferiorly in front, to form the ANTERIOR PALATINE CANAL, by joining with that of the opposite side, (for transmitting vessels and nerves); | *Anterior Palatine A. V. & N.*

Anterior—short, smooth and thick, being joined with the Alveolar Process, and curved, forming part of the Anterior Orifice of the Nasal Fossæ, and prolonged into the—

NASAL SPINE—internally, which unites with the one of the opposite side, to form the ANTERIOR NASAL SPINE—for attaching a cartilage of the Nose ; | *Triangular C.*

Posterior—also short but denticulated and beveled superiorly, to articulate with the Palatine Plate of the Palate bone :

2. **Oral Division of the Surface**—which belongs to the Mouth, and which is situated below the Palatine Process, being concave and uneven with furrows and apertures (for nutrient vessels):

3. **Nasal Division of the Surface**—which lies above the Palatine Process, and which is broad and very irregular, forming the Outer Wall of the Nasal Fossæ, and presenting the—

   1. **Orifice of the Antrum**—a large irregular opening, situated a little behind the middle, having the margins thin, irregular and ragged—so as to make the hole quite cribriform at times,—and being overlapped by the Ethmoid above, the Palate behind, and the Inferior Turbinated below : It leads into the—

Contd.--

Maxillary Sinus—or **Antrum of Highmore**—a large prismatic Cavity, existing in the bone, and formed—above by the Orbitar Plate, below by the Alveolar Process, before by the Facial Plate and behind by the Zygomatic Plate,—and having the—

Apex—formed by the Molar Ridge and the Malar Process,

Base—by the Nasal Surface itself ;

Roof—formed by the Orbitar Plate, traversed by the Infra-orbitar canal,

Floor—by the Alveolar Process, frequently pushed up and perforated by the Fangs of the teeth ;

Anterior Wall—formed by the Facial Plate, frequently presenting some projecting Laminæ that subdivide the cavity;

Posterior Wall—formed by the Zygomatic Plate, presenting the—

Posterior Dentar Canals—which (transmit vessels and nerves to the teeth, and) begin above and behind near the centre of the Surface. and, sweeping downward and forward, open either on the Facial Surfce, or in the Cavity of the Antrum, or in the Alveoli of the teeth,—somctimes getting lost in the cancelli and at others degenerating into mere grooves :

Posterior Dental A. V. & N.

2. **Half-Cells**—lying above the Orifice of the Antrum, and completed by the Ethmoid ;
3. **Lower Nasal Surface**—lying below the Orifice, being smooth and concave, and belonging to the Inferior Meatus of the Nose, having the—

Palatine Fissure—at its back part, running obliquely downward and backward from the Orifice of the Antrum, to receive the Maxillary Process of the Palate bone:

4. **Palatine Surface**—situated behind the Orifice of the Antrum and above the Palatine Fissure, being rough to unite with the Vertical Plate of the Palate bone. and having the—

Posterior Palatine Groove—running from the Posterior Border downward and forward, traversing obliquely along this surface and forming with the Palate bone, the Posterior Palatine Canal (for transmitting vessels and nerves) ;

Posterior Palatine A. V. & N.

Contd.—

5 **Naso-Lachrymal Groove**—running upward and forward just in front of the Orifice of the Antrum, being very deep and sometimes converted into a canal, and contributing to form (with the Lachrymal bone) the—

NASO-LACHRYMAL CANAL—that forms a communication between the cavity of the Orbit and that of the Nose ;

6. **Inferior Turbinated Crest**—horizontal and situated in front of the Naso-Lachrymal Groove, for articulation with the Inferior Turbinated bone :

II. Borders—seven ; of which the—

Superior—three—are horizontal, forming the boundaries of the Upper Triangular Face of the prism, that represents the bone, and are the—

1. **Upper Internal**—thin and uneven, and divided into three portions—
   1. THE INCISURA LACHRYMALIS—in front and notch-like, which articulates with the Lachrymal bone :
   2. THE MIDDLE PORTION—straight, to articulate with the Ethmoid ;
   3. THE POSTERIOR PORTION—oblique and articulating with the Orbitar Plate of the Palate bone :
2. **Upper Anterior**—short and rounded, forming the Lower part of the Circumference of the Orbit :
3. **Upper Posterior**—thick and rounded, forming the Anterior boundary of the Spheno-Maxillary Fissure, and sometimes articulating externally with the Orbitar Plate of the Greater Wing of the Sphenoid :

Inferior—one—is also horizontal, comprising the—

Alveolar Arch—which constitutes the Lower Surface of the bone ;

Vertical—are also three, separating the three Quadrilateral Surfaces of the bone ; thus the—

1. **Anterior Vertical**—that separates the Inner from the Anterior Aspect, and is very thin and irregular, presenting from below upwards—
   - (1) **A straight portion**—which is almost vertical and forms the anterior thick extremity of the Inner Border of the Palatine Plate, and joins with the opposite bone ;
   - (2.) **The Anterior Nasal Spine**—separating the straight portion from the concave portion above, and attaching a cartilage of the Nose ; *Triangular C.* |
   - (3.) **The Nasal Notch**—which is deeply concave, and contributes to form the Anterior Aperture of the Nasal Fossæ :

Contd. --2. **Posterior Vertical**—thick and convex, separating the Internal from the Zygomatic Surface and constituting—

The Maxillary Tuberosity—which indicates the lodgment of the last Molar tooth ;

3. **External Vertical**--thick and obtuse, separating the Facial from the Zygomatic Surface, and constituting—

The Molar—or **Malar Ridge**—descending vertically downwards from the Malar Process and disappearing over the first Molar tooth :

III. Angles—five ;--three above and two below ; thus the—

1. **Upper External**—lying at the outer end of the Orbitar Plate and just at the top of the Molar Ridge, and constituting the—

Malar Process—a rough triangular eminence, directed upward and outward, to articulate with the Malar bone, and hollowed behind to form a portion of the Temporal Fossa, but very slightly so anteriorly where it belongs to the Canine Fossa ;

2. **Upper Anterior**—thin and broad and prolonged upwards, in form of the—

Ascending—or **Nasal Process**—flat and thicker behind than before, and tapering upwards, being directed upward, inward and backward, and having—

1. Surfaces—two ;—

Lev: Labii Sup :, & Lev : Labii Sup : Alæque Nasi M.

Outer—smooth and concave, and marked with vascular apertures (and giving attachment to muscles) ;

Inner—uneven, with the—

1. Rugosities—(sometimes a Half-Cell)—at the upper part, where it articulates with the Ethmoid ;
2. Middle Turbinated Crest—about the middle, and horizontal, articulating with the Middle Turbinated bone of the Ethmoid ;
3. Groove for the Middle Meatus of the nose—below the above Crest, which is shallow and marked with arterial furrows, and is bounded below by the—

Inferior Turbinated Crest—lying just at the root of the Process, and horizontal, for articulation with the Inferior Turbinated bone ;

Contd.— 2. **Borders**—four ;—

Lower—or **Base**—continuous with the rest of the bone ;

Anterior—thin, and beveled internally above and externally below, to articulate with the Nasal bone ;

Upper—or **Summit**—thick and toothed, for articulation with the Internal Angular Process of the Frontal ;

Posterior—very thick, presenting from within outwards—

1. An Inner Edge—thin and articulating with the Lachrymal bone ;
2. The Lachrymal Groove—which is continuous with the Naso-Lachrymal Groove on the Inner Surface ; and being in the Orbit, contributes to form, with the Lachrymal bone, the Lachrymal Groove of the Orbit, which is but the upper end of the Naso-Lachrymal Canal (and lodges a little sac) ; *Lachrymal Sac.*
3. An Outer Edge—thick, rounded and free, forming a portion of the Circumference of the Orbit:

3. **The Lachrymal Tubercle**—a little angular projection, situated at the base of the Process, just where the Outer Edge of the Posterior Border meets the body of the bone ;

3. Upper Posterior Angle—blunt and articulating with the Orbitar Process of the Palate bone ;

4. Inferior Anterior Angle—forming the front end of the Horizontal Plate and articulating with the bone of the opposite side ;

5. Inferior Posterior Angle—thick and round to articulate with the Tuberosity of the Palate bone.

Articulations—with the Nasal, Frontal, Lachrymal, Ethmoid and Palate ; with the Inferior Turbinated, Vomer and the bone of the opposite side ; and also with the Malar bone—as well as the teeth and sometimes the Sphenoid.

[**Structure**—The walls of the Antrum are compact, but the Processes are cellular.

[**Development**—in Four Pieces, which begin very early, even before the ossification of the Vertebræ, and soon after that of the Lower Jaw and Clavicle , thus—

I. **The Naso-Facial Portion**—comprising all the Facial Aspect, together with the Nasal Process ;

II. **The Orbito-Malar Portion**—comprising the Orbitar Plate and the Malar Process ;

III. **The Palatal Portion**—comprising almost the whole Palate, excepting the Incisor Piece ;

IV. **The Incisor Portion**—or PIECE—lying just behind the Incisor teeth, and including only a small bit of the Palate, with the Posteror Edge of the INCISOR portion of the Alveolar Arch ;

The Ossific Points—have not yet been fully ascertained.

3. THE NASAL BONES-

Are small and oblong, forming the Bridge of the Nose; and presenting—

Surfaces—two ;—

Anterior—smooth and transversely convex but vertically concave, being marked with vascular holes and furrows (and covered by a muscle in the recent state);

Orbicularis Palpebrarum M.

Posterior—which is just the reverse of the Anterior Surface, and presents—

Nasal branch of the Ophthalmic N.

A Longitudinal Groove—(for the passage of a nerve):

Borders—four ;—

Superior—short and thick, convex and serrated, and articulated with the Nasal Notch of the Frontal bone ;

Inferior—thin and long, (and fixing the cartilage of the Nose) and sloping downwards externally, presenting—

Lateral C.

1. **A smooth Notch**—at the middle (for transmitting a nerve);

Nasal N.

2. **The nasal Angle**—a sharp projection internally where it meets the opposite bone :

External—long and slightly serrated, being thicker at the upper part and beveled anteriorly to be overlapped by the Internal Border of the Nasal Process of the Superior Maxillary, which itself is overlapped by the lower part;

Internal—shorter than the External, being also thicker at the upper part, and presenting—

A Longitudinal Crest—along its posterior aspect, to form, with the one of the opposite bone, a GROOVE—for receiving the Nasal Spine of the Frontal above, and the Perpendicular Plate of the Ethmoid below.

Articulations—with the FRONTAL, UPPER MAXILLARY, ETHMOID and OPPOSITE NASAL.

[**Structure**—cellular substance, enclosed in two compact layers

[**Development**—from one single point, appearing in the second month of gestation, when the Vertebræ ossify.

4. THE LACHRYMAL BONES-

Are the smallest and thinnest of all bones, and are situated at the anterior part of the Inner Wall of the Orbit, presenting—

Surfaces—two ;—

Orbitar—or **External**—divided by a Vertical Ridge into two parts, and therefore presenting the—

1. **Vertical Ridge**—along the middle, which is prolonged downwards in form of a hook-like process to meet the Lachrymal Tubercle of the Upper Maxillary, and which thus completes the upper aperture of the Naso-Lachrymal Canal ;
2. **Posterior Portion**—large and smooth, flat and continuous with the Os Planum of the Ethmoid ;
3. **Anterior Portion**—narrow and perforated with many vascular foramina, being concave so as to form—
   A VERTICAL GROOVE—which with a corresponding Groove on the Posterior Border of the Nasal Process of the Upper Maxillary, completes the LACHRYMAL GROOVE OF THE ORBIT (for lodging a sac) ;

Lachrymal Sac.

Nasal—or **Internal**—which is just the reverse of the External surface, and therefore presents—

1. **A Vertical Groove**—corresponding to the Outer Crest ;
2. **A Posterior Division**—wide and rough, uniting with the Ethmoid ;
3. **An Anterior Division**—smooth and convex, belonging to the Middle Meatus of the Nose :

Borders—four ;—

Superior—thick and short, presenting a Half-cell, and articulating with the Internal Angular Process of the Frontal bone ;

Inferior—divided by the end of the Crest into two parts ;—

1. **Posterior portion**—straight and articulated with the anterior division of the Upper Internal Border of the Upper Maxillary ;
2. **Anterior portion**—descending downwards in form o the—
   ANGULAR PROCESS—called the Lachrymal Angle, which meets the Lachrymal Process of the Inferior Turbinated bone, for forming the Inner and Posterior Wall of the Naso-Lachry-mal Canal :

Posterior—thin and uneven, and articulating with the Anterior border of the Os Planum ;

Anterior—longest and grooved, so as to receive the Inner Edge of the Posterior Border of the Nasal Process of the Superior Maxillary.

Articulations—with the ETHMOID and FRONTAL, the UPPER MAXILLARY and the INFERIOR TURBINATED bones.

[**Structure**—of extremely thin compact tissue.

[**Development**—from one single point, appearing immediately after those for the Vertebræ.

5. THE PALATE BONES-

Are very complex and are situated, on each side, between the Upper Maxillary and the Pterygoid Process of the Sphenoid ; each bone consisting of TWO PLATES joined at a right angle ; thus—

I. The Palatine or Horizontal Plate—thick

and quadrilateral, and continuous with the Palatine Process of the Superior Maxillary bone ; having, like that Plate, two Surfaces and four Borders ; thus—

Surfaces—two ;—

Upper—laterally concave and antero-posteriorly plain; contributing to form the floor of the Nasal Fossæ ;

Lower—level but rough, forming the back part of the Hard Palate, and presenting—

1. **A Transverse Ridge**—behind (for the attachment of a muscle) ; *Circumflexus Palati M.*

2. **The Lower Openings of the Posterior Palatine Canals**—at the outer end of this Ridge of these, the— *Posterior Palatine A. V. & N.*

LARGE one—is oval (for transmitting the main trunk of a nerve with vessels), and the—

ACCESSORY ones—are much smaller, and are situated near the Large one (for transmitting smaller branches of the same) ;

3. **The Palatine Groove**—running forwards from the (Large) Posterior Palatine Opening—to become continuous with a similar Groove on the Palatine Plate of the Upper Maxillary—,(and lodging the same vessels and nerve) : *Posterior Palatine A. V. & N.*

Borders—four ;—

External—forming nearly a right angle with the rest of the bone ;

Internal—thick and serrated, for uniting with the opposite bone, and surmounted by a CREST along the upper aspect, to form with the opposite bone, a Groove, that is continuous with the Groove, formed by the similar parts of the Upper Maxillary, and which receives the Lower Border of the Vomer bone ;

Anterior—serrated and beveled inferiorly, to unite with the Palatine Process of the Upper Maxillary ;

Posterior—or **Guttural**—thin, smooth and concave, forming the end of the Hard Palate and attaching the Soft, and being prolonged internally in form of— *The Velum Pendulum Palati.*

A Projecting Angle—which, by uniting with the one of the opposite side, forms the—

POSTERIOR NASAL SPINE—(for fixing the Uvula).

II. The Vertical Plate—thin, quadrilateral,

oblong and inclined upwards and inwards, presenting two Surfaces, four Borders, two Processes and a Notch ; thus—

1. Surfaces—two ;—

Internal—smooth, presenting from below upwards—

1. **A Horizontal Groove**—which is shallow, forming part of the Inferior Meatus of the Nose ;
2. **The Inferior Turbinated Crest**—which is horizontal and continuous with the similar Crest of the Upper Maxillary, for fixing the Inferior Turbinated bone ;

   Another Horizontal Groove—belonging to the Middle Meatus of the Nose ;

4. **The Superior Turbinated Crest**—also horizontal and continuous with the Middle Turbinated Crest of the Upper Maxillary, for articulation with the Middle Turbinated bone of the Ethmoid :

External—irregular, presenting—

1. **A Smooth Portion**—above and behind, which is small and triangular, and forms the bottom of the Pterygo-maxillary Fossa ;
2. **An Uneven Portion**—in front and below, and large—for articulation with the back part of the Inner Surface of the Upper Maxillary,—showing the—

   POSTERIOR PALATINE GROOVE—going downwards, forwards and inwards, and forming, with the Upper Maxillary, the (Large) Posterior Palatine Canal (for transmitting vessels and nerve) :

Posterior Palatine A. V. & N.

II. Edges—or Borders—four ; of which the—

1. **Inferior**—joins the Horizontal Plate at a right angle
2. **Anterior**—is thin and uneven, having the—

   Maxillary Process—prolonged from the lower part, below the level of the Inferior Turbinated Crest, and going upwards and forwards, usually as a triangular projection, of very irregular shape and size, to be received into the Palatine Fissure of the Upper Maxillary, which passes backwards and downwards from the Orifice of the Antrum ;

3. **Posterior**—broad and vertical, but rough and uneven—for articulation with the Pterygoid Plate, having—
   1. **A Serrated Groove**—along its length, into which the Anterior Edge of the Pterygoid Process is received ;

Contd.—

2. **The Pyramidal Process**—or **Tuberosity** (of the Palate bone)—situated just at the Angle where this Border joins the Posterior Border of the Horizontal Plate, having the—
    1. BASE—situated at this point of junction ;
    2. APEX—projecting outwards, backwards and downwards, to be received into the bifurcation of the Pterygoid plates ;
    3. POSTERIOR SURFACE—showing—

       THREE VERTICAL GROOVES—of which the INTERNAL and EXTERNAL are rough, to articulate with the Internal and External Plates of the Pterygoid Process, while the—

       MIDDLE GROOVE—is wide and smooth, and forms the lower part of the Pterygoid Fossa, between the Pterygoid Plates ;
    4. INFERIOR SURFACE—belonging to the Hard Palate, and presenting one or two ORIFICES OF SOME ACCESSORY POSTERIOR PALATINE CANALS ;
    5. OUTER SURFACE—uneven, to articulate with the Inner Surface of the Upper Maxillary ;

4. **Superior**—is irregular, having two Processes and a Notch : thus the—

I. **Sphenoidal Process**—standing upwards and *inwards*, to join with the Sphenoid, and of the form of a triangular prism lying horizontally, and hence having—

SURFACES—three ;—

1. INTERNAL—smooth, forming a portion of the outer wall of the Nasal Fossæ ;
2. EXTERNAL—divided into two portions ;—
    1. A POSTERIOR PORTION—rough, for articulation with the inner aspect of the root of the Pterygoid Process ;
    2. AN ANTERIOR PORTION—small and smooth, and belonging to the floor of the Pterygo-maxillary Fossa ;
3. SUPERIOR—forming the summit of the Process, and rough, for articulation with the Horizontal Portion of the Sphenoidal Turbinated bone (at the floor of the Sphenoidal Sinus), and presenting the—

   PTERYGO-PALATINE GROOVE—passing from behind forwards and outwards, to complete the Pterygo-palatine Canal along the root of the Pterygoid Process (for transmitting vessels) ; *Pterygo-palatine A. & V.*

Contd.— BORDERS—two ;—

1. POSTERIOR—thin and uneven, for articulation with the root of the Pterygoid Process ;
2. ANTERIOR—thicker and even, forming the posterior boundary of the SPHENO-PALATINE NOTCH :

II. **Orbitar Process**—standing upwards and *outwards*, and in form like a thick lozenge lying horizontally, and having—

1. A CELL—within, forming a Sinus of the bone, which communicates usually with the Sphenoidal Sinus but sometimes with the Posterior Ethmoid Cells ;
2. A PEDICLE—or NECK—which supports the Process and presents internally—
    1. THE SUPERIOR TURBINATED CREST—quite at the root, uniting with the Middle Turbinated bone of the Ethmoid ;
    2. A HORIZONTAL GROOVE—for the Superior Meatus of the Nose, situated just above that Crest:
3. SURFACES—five ; all of which are more or less quadrilateral ; thus the—
    1. UPPER—or ORBITAR—which forms the summit of the Process, and is directed upward and outward, forming part of the floor of the Orbit; and which is smooth and continuous with the Orbitar Plate of the Upper Maxillary ;
    2. OUTER-ANTERIOR — or MAXILLARY Surface—oblong, *uneven* and directed outward, DOWNWARD and *forward*, to articulate with the Inner Surface of the Upper Maxillary ;
    3. OUTER-POSTERIOR—or PTERYGO-MAXILLARY Surface—continuous with the Zygomatic Surface of the Upper Maxillary, and oblong, smooth and directed outward, DOWNWARD and *backward*, and belonging to the Anterior Wall of the Pterygo-maxillary Fossa ;
    4. INNER-ANTERIOR—or ETHMOIDAL Surface—directed inward, UPWARD and *forward*, to join with the Ethmoid ;

5. INNER-POSTERIOR — or SPHENOIDAL Surface—directed inward, UPWARD and *backward*, to articulate with the vertical portion of the Sphenoidal Turbinated bone, and generally presenting the—

ORIFICE OF THE PALATINE CELL—communicating with the Sphenoidal Sinus.

N. B. Sometimes this Orifice is seen in the Ethmoidal Surface, in which case the Palatine Cell communicates with the Posterior Ethmoidal Cells.

III. **Spheno-Palatine Notch**—round and smooth, and situated between the Orbitar and Sphenoidal Processes; it is sometimes converted into one or more Holes, and forms a communication between the Nasal and Pterygo-Maxillary Fossæ, (lodging a nervous ganglion and transmitting an artery).

Spheno palatine Gn. Nasal branch of the Internal Maxillary A.

Articulations—with the UPPER MAXILLARY mainly, to which it is almost an appendage; with the OPPOSITE PALATE, the ETHMOID, the SPHENOID, the SPHENOIDAL TURBINATED and the MIDDLE and INFERIOR TURBINATED bones; and also with the VOMER.

Structure—compact where thin, and cellular where thick.

Development—from a single point at the Angle of junction of the two Plates.

6. THE INFERIOR TURBINATED BONES,

Which are porous bones of variable size, suspended horizontally one along each Outer Wall of the Nasal Fossæ, just below the Orifice of the Antrum: they are both oblong in form, and are curved so as to be convex internally and concave externally, presenting—

Surfaces—two, both spongy, free and perforated with vascular holes, (and covered in the recent state with a membrane);—

Nasal or Schneiderian Mb.

Internal—convex, with arterial grooves and canals;

External—concave, forming the inner wall of the Inferior Meatus of the Nose:

Edges—two—

Lower—free and thick, cellular and convex;

Upper—thin and uneven, and divided into three portions:—

Posterior portion—articulating with the Lower Turbinated Crest of the Palate bone;

Anterior portion—articulating with the Lower Turbinated Crest of the Upper Maxillary bone;

Middle portion—bridging over the lower part of the Orifice of the Antrum, and presenting from behind forwards—

1. **The Ethmoidal Process**—thin and going upwards along the back part of the Orifice of the Antrum to join the Ethmoid bone;
2. **The Maxillary—or Auricular Process**—broad and like a dog's ear, bending downwards and outwards so as to hook over the Lower Edge of the Orifice of the Antrum, and thus fixing the bone very firmly there;
3. **The Lachrymal Process**—pyramidal and going upwards and forwards, having—
    1. A SUMMIT—to articulate with the Angle of the Lachrymal bone;
    2. Two BORDERS—to articulate with the two Lips of the Naso-Lachrymal Groove of the Upper Maxillary bone:

Extremities—two—both free—

Posterior—long and sharp;

Anterior—short and rounded.

Structure—of numerous laminæ of compact tissue, very irregularly disposed.

Development—from one single point of ossification, appearing about the middle of fœtal life.

Articulations—with the UPPER MAXILLARY, PALATE, ETHMOID and LACHRYMAL bones.

* * *

II. The Median Bones of Face.

1. THE VOMER-

A thin, flat, median and quadrilateral bone, forming the posterior part of the Septum of the Nose, and presenting—

Surfaces—two, one on each side—and, therefore, called the Lateral Aspects, which are smooth and generally concave on one side, having the—

Naso-Palatine Groove—(on either side) at the lower part, running obliquely downwards and forwards, and gradually deepening to meet the Upper Aperture of the Anterior Palatine Canal on the Palatine Process of the Upper Maxillary bone; and transmitting vessels and nerves;

Naso-palatine A. V. & N.

Borders—four, forming the sides of a parallelogram; thus—

I. Horizontal—two, which are parallel with each other—

1. **Upper**—or **Sphenoidal**—thickest, presenting—
   - **A Deep Groove**—along the centre, to receive the Rostrum on the Lower Aspect of the Body of the Sphenoid, and dividing this border into—
     - **Two Alæ**—or **Wings**—projecting one on each side, to be overlapped and retained by the Angular Laminæ at the bases of the Pterygoid Processes of the Sphenoid;
2. **Inferior**—longest, somewhat thicker anteriorly, and serrated throughout, to be received into the FURROW formed by the surmounting Crests on the Internal Borders of the Palatine Plates of the Upper Maxillary and Palate bones:

II. Oblique—two, which are also parallel, and slope from above downward and forward; thus—

1. **Posterior**—smooth and free, separating the Lateral Apertures of the Posterior Nares;
2. **Anterior**—rough, presenting generally a GROOVE throughout, to receive the Posterior Border of the Vertical Plate of the Ethmoid bone above, and that of the Triangular Cartilage of the nose below.

Structure—of two compact laminæ.

Development—from two points, one on each side, at the lower part, appearing about the time of ossification of the Vertebræ.

Articulations—with the BODY OF SPHENOID, the SPHENOIDAL TURBINATED and the ETHMOID bones;—also with the NASAL CARTILAGE and the UPPER MAXILLARY and PALATE bones.

2. THE INFERIOR MAXILLARY-

Is the largest of the Facial bones, being single and symmetrical, consisting of a curved Body, with two flat branches or Rami that ascend from its posterior ends ;—

I. The Body—or middle portion, which is thick and strong, and of a horse-shoe shape, having—

Surfaces—two ;—

1. **Anterior**—convex laterally and somewhat concave vertically, presenting from the median line outwards—

1. **The Symphisis of the Chin**—a vertical ridge situated just in the median line, indicating the original union of the two halves of the bone, and terminating below at—
   The Mental Process—a triangular prominence, lying immediately under the skin, and surmounted by—
   LevatorMenti M. **Rough Depressions**—on the sides of the Symphisis (for the attachment of a muscle);

2. **The Foramen Menti**—lying more externally and just below the 2nd Bicuspid tooth, (for transmitting vessels and nerves);
   Inferior Dentar A. V. & N.

3. **The External Oblique Line**—passing outwards like a ridge, from the base of the Mental Process to the Anterior Border of the Ramus, (and giving attachment to two muscles above, and one below);
   Depressor Labii Inferioris & Depressor Anguli Oris M.
   Platysma myoides M.

2. **Posterior**—concave laterally and somewhat convex vertically, presenting from the median line outwards—

1. **A vertical Furrow**—along the middle, corresponding to the Symphisis of the Chin, and indicating the original union of the two halves of the bone, and terminating below at the—
   Genio hyo-Glossi M.
   Genio-hyoidM. **Genial Processes**—four—in two pairs (for attaching muscles ;—Upper pair—one, Lower pair—another);

2. *Sublingual G.* **The Sublingual Fossa**—lying external to the Genial Tubercles (and lodging a gland) on each side, immediately above the—
   Digastric M. **Digastric Fossa**—that is rough and situated very close to the Lower Border of the bone, (and gives insertion to a muscle);

3. **The Internal Oblique Line**—which is more prominent than the External, and runs upwards and backwards, from between the Digastric and the Sublingual Fossa, to the Inner Edge of the Anterior Border of the Ramus, (and gives attachment to two muscles):
   Mylo-hyoid & Superior Pharyngeal Constrictor M.
   Sub-maxillary G. **The Sub-maxillary Fossa**—is a deep fossa that is situated below the most prominent part of the Internal Oblique Line (and lodges a gland):

Contd.—**Borders**—two—

Inferior—horizontal and rounded, and thicker before,
Platysma myoides M. | (attaching a muscle and) presenting the—

Facial Groove—at the back part, running upwards, just where this Border joins the Inferior Border
Facial A. | of the Ramus (and lodging an artery):

Upper—or **Alveolar**—which is narrow in front, but wider behind where it encroaches upon the Inner Surface, and which presents in its whole length—

The Alveoli—or sockets for the teeth, which are altogether sixteen; those for the 2 Incisors, 1 Canine and 2 Bicuspids, on each side, being single as in the Upper Jaw, while the rest are double.

N. B.—THE ALVEOLAR PORTION is all that portion of the bone that lies above the Oblique Lines; it is very deep in children when it contains the teeth, but becomes very narrow in old toothless persons. In the adult it is marked with alternate grooves and prominences like those on the Upper Maxillary bone.

II. The Rami—or Branches—which are two

symmetrical plates of bone, one on each back end of the Body, and are flat and quadrilateral in form, ascending in the lateral regions of Face, and presenting—

Surfaces—two—

I. **External**—continuous with the External Surface of the Body, being uneven and somewhat cancave, with—

Rough Impressions—at the lower part (for attach-
Masseter M. | ing a big muscle that covers the whole surface):

II. **Internal**—continuous with the Internal Surface of the Body and rather irregular, showing—

1. **An Oblique Opening**—in the centre, leading into—

The Inferior Dentar Canal—a canal (for a nerve with vessels) passing through the bone, at first forwards and downwards through the Ramus, and then horizontally forwards through the Body just beneath the Alveoli,
Inferior Dentar A. V. & N. | until it reaches the Incisor teeth; there giving two branches into the structure of the bone, it turns backwards by making a sudden angle, and terminates at the Mental Foramen; it is nearest the Internal plate in the posterior two-thirds, and next the External plate in the anterior third of its course, and gives off small branches throughout to the Teeth and the Jaw:

Contd.—2 **The Spinous Process**—which is but the prolonged anterior margin of the above Orifice of the Dentar Canal, (and attaches a ligament); while the *internal* margin is notched in form of—

Internal Lateral L. of Lower Jaw.

3. **The Mylohyoid Notch**—situated just behind the Spinous Process, (transmitting a nerve):

Mylohyoid branch of Inferior Dentar N.

4. **The Mylohyoid Groove**—an oblique groove, passing forwards and downwards, from the Notch to the outer end of the Sublingual Fossa, (and lodging vessels with a nerve):

Mylohyoid A. V. & N.

5. **Rough Impressions**—below the Dentar Hole (for attaching a big muscle):

Internal Pterygoid M.

Borders—four—

1. Anterior—broad and nearly vertical, continuous with the Alveolar Border and presenting—

1. **The Buccinator Groove**—along the middle and vertical, (for attaching a muscle);

Buccinator M.

2. **The Two Edges** of this Groove—which are continuous with the two Oblique lines on the Internal and External Surfaces of the Body:

2. Inferior—thick and straight, and continuous with the Lower Border of the Body, from which it is marked off by the FACIAL GROOVE:

3. Posterior—thick, smooth and rounded, and parallel to the Anterior Border, presenting at the lower part—

The Angle of the Jaw—situated just at the point where this Border joins the Inferior Border of the Body. It is slightly deflected outwards and is rough on the two sides (for the attachment of muscles), and also intermediately (for the attachment of a ligament). It is very obtuse in children and in old persons, but is almost a right angle in the adult:

Masseter M. externally
Internal Pterygoid M internally
Stylo-maxillary L.

4. Superior—thin and curved, supporting two Processes with a Notch between; thus the—

1. **Coronoid Process**—which is anterior and triangular, flat and thin, going upwards and outwards (and attaching a muscle by the apex);

Temporal M.

2. **Condyloid Process**—which is posterior, shorter and thicker, having the—

Contd.—1. CONDYLE—at the top, which is oblong in shape, and transversely long, and is convex on the upper aspect; and which is placed so obliquely that its outer end is both higher and more forward than the inner end; it articulates with the anterior portion of the Glenoid Cavity, by the intervention of a fibro-cartilage;

Inter-articular Fibro-cartilage.

2. NECK—which is the contracted portion that supports the Condyle, and is flattened from back to front, being convex behind, and presenting the—

1. PTERYGOID DEPRESSION—in front (for attaching a muscle);

External Pterygoid M.

2. TUBERCLE—on the outer part, (for attaching a ligament):

External Lateral L. of Lower Jaw.

3. Sigmoid Notch—a semilunar notch, situated between the two Processes, (transmitting vessels and nerves) and intended for receiving the Zygomatic Arch during mastication.

Structure—Spongy substance enclosed in two compact layers, and traversed by the Dentar Canal.

Articulations—with the TEMPORAL BONES and the TEETH.

Development—in two lateral pieces at birth, which begin to join in the FIRST YEAR after birth, the junction being completed by the SECOND YEAR.

This bone begins to ossify very early, "before any other bone, except the Clavicle"; and hence its ossific points have not been well made out yet. There is a main point for EACH HALF of the bone: but separate pieces have also been noticed, by different observers, for the CORONOID PROCESS, the CONDYLE, the ANGLE, and the INNER SIDE OF THE ALVEOLUS.

THE TEETH—

Are altogether THIRTY-TWO (in the adult)—16 above and 16 below. They are conical in form, each having three portions; thus—

1. **The Root**—that lies implanted in the socket of the Jaws, and presents, at the point, an ORIFICE for the passage of vessels and nerves;
2. **The Neck**—the contracted portion, encircled by the gums;
3. **The Crown**—the portion that is free and covered with a very hard substance called the ENAMEL. The teeth are always numbered from before backwards; and are—

Classified into the—

1. **Incisors**—or **Cutting Teeth**—which are EIGHT, the 4 middle or front-teeth in each Jaw, having the—

   Crown—wedge-shaped, with a straight free border, &

   Root—single and flattened on the sides:

2 **Canines**—or **Tearing Teeth**—the FOUR longest, two in each Jaw, one on each side—behind the Incisors, having the—

   Crown—pyramidal and terminating at a blunt point, &

   Root—single, but longer and stouter than those of the Incisors:

3. **Molars**—or **Grinding Teeth**—which are the TWENTY largest, ten in each jaw, 5 on each side, behind the Canines, having the—

   Root—divided, the divisions being known as the FANGS, and

   Crown—wide and flat with TUBERCLES on the top:

   These Molars are again *CLASSIFIED* into the—

   (1) PREMOLARS—or BICUSPIDS—or SMALL MOLARS—which are EIGHT altogether, four in each jaw, 2 on each side, just behind the Canine, and having the—

   Crown—oblong and compressed antero-posteriorly, with two Cusps or tubercles on the top, placed side by side;

   Root—grooved on each side and with two holes at the point, and usually divided into TWO Fangs in the Upper Jaw:

   (2.) MULTICUSPIDS—or TRUE MOLARS—the TWELVE largest, not existing among the first or temporary set They are 6 in each jaw, 3 on each side, behind the Premolars and have the—

   Crown—large and cuboid, with 4 or 5 Tubercles on the top situated towards the 4 angles;

   Root—divided into TWO Fangs in the Lower, and THREE (or rarely more) in the Upper jaw; of the Fangs the first two are anterior and posterior, while the third is internal.

◆

Differential Characters—of the teeth; thus—

Of the **Incisors**;—the SUPERIORS are larger and stronger—especially the central two, which are the smallest in the Lower Jaw:

„ **Canines**;—the UPPER or the Eye-teeth are behind the Lower and are much larger and longer, sometimes touching the base of the Nasal Process:

„ **Bicuspids**;—the UPPER are larger (with two Fangs)—especially the Second. while the first Lower is usually like the Canine:

„ **True Molars**;—these diminish in size from the first to the last; this latter is called the WISDOM-TOOTH, whose fangs are usually collected together.

Development—all after birth—in two crops; both crops coming out earlier in the Lower than in the Upper Jaw; thus—

1. **The Deciduous**—or **Milk-teeth**—which are only twenty, and are shed off after the fifth year; they appear thus—

INCISORS	CANINES	MOLARS
7—9 ,	18 ,	12—24 months:

2. **The Permanent**—which are thirty-two, coming out thus—

INCISORS	CANINES	BICUSPIDS	MOLARS
7—8 ,	11 ,	9—10 ,	6—13—21 years.

In the fifth year there are the 20 Milk-teeth out; and of the Permanent set, 28 (i. e. all except the wisdom-teeth) lie imbedded in the Jaws; thus making the total, at that age, 48—the largest number possible for any age.

THE HYOID OR U-SHAPED BONE-

Is a compound bone, consisting of three segments and two appendages; the whole forming a horse-shoe shaped bone, situated horizontally at the upper part of the Neck, parallel to the Lower Jaw, and presenting the—

I. Body—which is the anterior and central portion of the Arch, and is somewhat quadrilateral in shape, having—

Surfaces—two—

1. **Anterior**—convex and looking not only forwards but also a good deal upwards, presenting—
    1. **A Vertical Ridge**—along the middle, dividing the Surface into two lateral halves;
    2. **A Horizontal Ridge**—dividing it again into an Upper and a Lower division, and showing—

        A TUBERCLE—where it cuts the Vertical RIDGE;

Contd.—3. **Upper Division of the Surface**—looking very much upwards (and attaching the three genial with other muscles);

Genio-hyoid, Genio-hyo-glossi & Lingualis M.

4. **Lower Division of the Surface**—looking more forwards (and attaching the three upper-hyoid muscles with an aponeurosis):

Mylohyoid & stylo-hyoid M. Digastric Ap.

2. **Posterior**—concave and looking a good deal downwards, (being covered by a membrane in the recent state):

Thyro-hyoid Mb.

Borders—four—

Superior—rounded and uneven, (attaching two of the genial muscles and a membrane);

Genio-hyo-glossi & Lingualis M. Thyro-hyoid Mb.

Inferior—thin and long (attaching the three lower-hyoid muscles);

Sterno-hyoid, Thyro hyoid & Omo-hyoid M.

Lateral—RIGHT and LEFT—short, convex and oval and articular, to join with the Greater Horns.

II. Greater Horns—or the Cornua—projecting backward and outward from the Lateral Borders of the Body, each terminating in a tubercular extremity, and having—

Surfaces—two—

Outer—continuous with the Anterior Surface of the Body (and attaching two muscles);

Thyro hyoid & Hyo-glossus M

Inner—looking somewhat downwards (and covered by a membrane in the recent state):

Thyro-hyoid Mb.

Borders—two—

Superior—sharp and short, (attaching two muscles and a membrane):

Hyoglossus & Superior Constrictor of Pharynx M. Thyro-hyoid Mb.

Inferior—rather external, (attaching part of a lower-hyoid muscle):

Thyro-hyoid M.

Ends—two—

Anterior—concave, joining with the Outer End of the Body;

Posterior—small and tubercular, (for attaching a ligament).

Thyro-hyoid L.

III. **Lesser Horns**—or **Cornicula**—two little pyramidal eminences, of irregular shape and size ; each having—

1. **A Base**—articulated with the Body, at the point where it meets the Greater Horns ;

2. **A Summit**—going upward, backward and outward (and attaching a ligament, which is ossified in rare in
Stylo-hyoid L | stances).

[**Structure**—cellular in the Body and compact in the Horns.
[**Development**,—the five pieces from 5 points of ossification.

Articulation—none. This is strictly a SOLITARY BONE, being supported in its position by only muscles and ligaments.

THE FACE IN GENERAL.

The Facial Bones, taken together, form an irregular cube, having the Upper Aspect united with the front part of the Base of the Skull, and the Posterior Aspect with the Pterygoid Processes of the Sphenoid bone; the Lower Aspect forming the Roof of the Mouth; while the Anterior, with the Lateral Regions combined, make up what is usually known as the Countenence or Face. This frame work is broader behind than before, both above and below ; but its vertical diameter is larger in front than behind ; where again it is shorter along the middle line than externally. It presents—

Aspects—four—

I. **Superior**—united with the front part of the Base of the Cranium ;

II. **Anterior**—longest along the middle line, that is from the Root of the Nose to the Chin ; and bounded on each side by the prominence of the Malar bone with the Anterior Border of the Ramus of the Lower Jaw. This Aspect is widest at the level of the Cheek-bones, and presents—from above downwards—

(I.) Along the Middle—

1. **The Nose**—a hollow arched eminence, formed by the Nasal bones with the Nasal Processes of the Upper Maxillary, and showing the—
    1. **Inter-nasal Suture**—in the median line, formed by the two Nasal bones
    2. **Convexity of the Nasal Bones**—on the sides, smooth and perforated by vascular
Pyramidalis Nasi M. | holes (and covered with muscles) ;
    3. **Naso-Maxillary Suture**—still externally, on each side formed by the union of the Nasal bone with the Nasal Process of the Upper Maxillary :

Contd.—2. **The Anterior Orifice of the Nasal Fossæ**—resembling, in shape, the heart (on playing cards); and formed by the Lower Border of the Nasal Bones above, and the Nasal Notch of the Upper Maxillary bones below; and so presenting the—

(1.) Nasal Angle—above, formed by the two Nasal bones;

(2.) Nasal Notches—on each side, formed mainly by the Upper Maxillary bones;

(3.) Anterior Nasal Spine—below, formed by the two Upper Maxillary bones:

3. **The Inter-maxillary Suture**;

4. **The Incisor Teeth**—forming an upward convexity in the Lower Jaw;

5. **The Symphysis of the Chin**;

6. **The Mental Eminence:**

(2.) *Laterally*—

1. **The Lower part of the Circumference of the Orbit**—formed by the Malar and Upper Maxillary bones;

2. **The Malar Prominence**—perforated by the MALAR HOLES (transmitting vessels); with—

Malar A.

The Infra-Orbitar Fossa—internally, (attaching muscles and) perforated by the INFRA-ORBITAR HOLE—(transmitting nerve with vessels);

Levator Labii Superiors & Levator Labii Superiors alæque Nasi M.
Infra-Orbitar N. A. & V.

3. **The Canine Eminence**;—with the—

Incisive Fossa—internally (attaching muscles);

Depressor Labii superioris Alæque Nasi M.

4. **The Alveolar and Dentar Arches**—of the Upper and Lower Jaws—the free edge of which forms a downward convexity on each side in the Upper Jaw, extending, in one continuous line, from the first Incisor to the Last Molar tooth;

5. **The Mental Hole**—(transmitting vessels and nerves)—with—

Inferior Maxillary N. A. & V.

The External Oblique Line—of the Lower Jaw, (attaching muscles);

Depressor labii Inferioris, Depressor Anguli Oris, Platysma myoidis M.

6. **The Lower Border of the Jaw**—with the Facial Groove—(transmitting an artery).

Facial A.

III. Posterior Region—bounded on each side by the whole Posterior Border of the Ramus of the Lower Jaw; but extending, at the middle line, from the Upper Border of the Vomer to only the Posterior Border of the Hard Palate; and presenting—from within outwards—

1. **The Posterior Border of the Vomer**—with **the Posterior Nasal Spine**—below, formed by both
Azygos Uvulæ. | the Palate bones (and fixing a muscle);

2. **The Posterior Apertures of the Nasal Fossæ**—bounded below by the Posterior Border of
Velum pendulum Palati. | the Horizontal Plate of the Palate bone (attaching the Soft Palate), and externally by

3. **The Posterior Edge of the Internal Pterygoid Plate**—(attaching a muscle);
Superior Constrictor of the Pharynx M.

4. **The Pterygoid Fossa**—with the **Tuberosity**
Internal Pterygoid M. | **of the Palate bone**—between the two Plates of the Pterygoid Process (and attaching a muscle);

5. **A Space**—between the outer aspect of the Pterygoid
Internal and External Pterygoid M. | Process and the Ramus of the Jaw (which is filled with muscles);

6. **The Posterior Border of the Ramus** of the Jaw itself—with the Condyle above and the Angle below.

IV. Inferior Region—which contributes to form the Cavity of the Mouth, and which is divided into—

1. THE PALATINE ARCH—which is the horizontal portion, presenting—

A. Along the Middle—from behind forwards—

1. **The Lower Aspect of the Posterior Nasal Spine**;
2. **The Palatine Suture**—along the middle—formed by the two Palate and the two Maxillary bones, and showing the—
   1. Palatine Crest behind, and
   2. The Lower Opening of the Anterior
Anterior Palatine A. V. & N. Naso palatine Gn. | Palatine Canal—in front (transmitting vessels and nerves and lodging a ganglion).

B. On each side—

1. **The Lower aspect of the Tuberosity of the Palate bone**—with the
Small Palatine A. V. & N. | Accessory Posterior Palatine Openings—(transmitting small arteries and nerves);

Contd.— 2. **The Lower Surface of the Palatine Plate** of the Palate bone—with the—

Circumflexus palati M. | 1. Transverse Ridge—behind, attaching a muscle;

Posterior Palatine A. V. & N. | 2. Posterior Palatine Opening—externally, transmitting vessels and nerves;

3. Posterior Palatine Groove—passing forwards and inwards from the last:

3. **The Transverse Palato-Maxillary Suture**—between the HORIZONTAL Plates of the Palate and Maxillary bones:

Branches of Posterior Palatine A. V. & N. | 4. **The Palatine Plate of the Upper Maxillary** bone—which is concave, with the Posterior PALATINE GROOVE and the INCISIVE HOLES (for vessels and nerves).

2. THE DENTO-ALVEOLAR ARCH—which is the vertical portion, that is formed of the Dental and Alveolar Arches of the Upper and Lower Jaws;

3. THE BODY OF THE LOWER JAW itself—which is also vertical, presenting the—

1. **Genial Tubercles**—with the Median **Furrow**;
2. **The Sublingual** and the **Digastric fossæ**;
3. **The Internal Oblique line** and the **Inferior Border** of the Lower Jaw.

V. **Lateral** or **Zygomatic** Region—bounded in front by the Malar Ridge of the Upper Maxillary; behind by the Posterior Border of the Ramus of the Jaw; above by the Zygomatic Arch; and below by the Lower Border of the Ramus. This region is divided by the Body of the Ramus into two planes—

Masseter M. | 1. **The External Plane**—situated on the Ramus, and forming the Masseteric Fossa (for attaching a muscle);

2. **The Internal Plane**—formed mainly by the Zygomatic Surface of the Upper Jaw, and contributing to the Zygomatic and Spheno maxillary Fossæ.

THE CRANIO-FACIAL FOSSÆ.

These are the Fossæ resulting from the Union of the Cranial and the Facial bones. They are altogether five pairs:—

1. **Orbitar Fossæ,**
2. **Nasal Fossæ,**
3. **Temporal Fossæ,**
4. **Zygomatic Fossæ,**
5. **Pterygo-Maxillary Fossæ.**

ORBITAR FOSSÆ.

These are situated at the front and upper part of the Skull, and are of a Pyramidal form, with the base of their cavities turned forwards and outwards, and their apex backwards and inwards. Each Fossa has four Walls, four Corners or Angles, a Base and an Apex ; thus—

Walls—four—

Upper or **Vault**—formed by the Orbitar plate of the Frontal before, with the Lesser Wing of the Sphenoid behind ; presenting—

1. **The Transverse Suture**—between the Lesser Wing of the Sphenoid and the Orbitar Plate of the Frontal ;

2. **The Lachrymal Fossa**—behind the External Angu-
Lachrymal G. | lar Process of the Frontal, (for lodging a gland) ;

3. **The Pulley-Depression**—behind the Internal Angu-
Superior Oblique M. | lar Process, (for deflecting the tendon of a muscle) :

Lower or **Floor**—nearly flat, formed by the Orbitar Plate
Inferior Oblique M. | of the Upper Maxillary, with the Orbitar Process of the Malar (in front) and of the Palate bone (behind), and therefore presenting—

1. **The Suture**—between the Palate and Maxillary ;

2. **The Suture**—between the Maxillary and the Malar;

3. **The Infra-Orbitar Groove**—along the middle, ter-
Infra-orbitar N. A. & V. | minating at the Infra-Orbitar Canal, (and transmitting vessels and nerve) :

Outer—nearly flat and bounded by a Fissure above and below. It is formed by the Orbitar Plate of the Greater Wing of the Sphenoid, with the Orbitar Process of the Malar bone in front ; and presents—

1. **The Vertical Suture**—between the Sphenoid and the Malar ;

2. **The External Orbitar Foramina** ;

Malar N.-3. **The Malar Canals** :

Inner Wall—the smallest, formed by the Orbitar Plate of the Ethmoid, with the Lachrymal before and side of Body of the Sphenoid behind : and therefore presenting—

1. **The Vertical Suture**—between the Ethmoid and Lachrymal ;

2. **The Vertical Suture**—between the Ethmoid and Sphenoid ;

3. **The Crest**—of the Lachrymal bone, before which lies
Lachrymal Sac. | the Lachrymal Groove,

Corners —four—

Upper External—presenting the—

3rd, 4th, Ophthalmic of 5th and 6th N.

1. **Sphenoidal Fissure**—(transmitting nerves);
2. **Suture**—between the Orbitar Plate of the Sphenoid and that of the Frontal;
3. **Suture**—between the Malar and Frontal bones:

Upper Internal—presenting the—

1. **Internal Orbitar Holes**—two, (of which the Anterior one transmits a nerve);

Internal Nasal of Ophthalmic N.

2. **Ethmoidal Suture**;
3. **Suture**—between the Lachrymal and Frontal:

Lower Internal—presenting—

Three Sutures:—between 1. The PALATE and ETHMOID;
2. UPPER MAXILLARY and ETHMOID;
3. UPPER MAXILLARY & LACHRYMAL:

Lower External—presenting the—

Infra-Orbitar or **Spheno-Maxillary Fissure**—bounded externally by the Orbitar Plate of the Sphenoid, and internally by those of the Palate and Upper Maxillary bones; and completed generally by the Malar bone in front; being widest at the ends, (and transmitting several nerves and vessels).

Ascending branches from the Spheno palatine Gn. Posterior Dental branches of the Infra-orbitar N. Infra-orbitar branch of Internal Maxillary A.

The Circumference of Base—is quadrilateral, with curved Sides and rounded Angles, and is somewhat larger externally than internally. It is formed above by the Supra-orbitar arch, externally by the External Angular Process of the Frontal with the Orbitar Border of the Malar bone, internally by the Internal Angular Process of the Frontal with the Nasal Process of the Upper Maxillary, and below by the Anterior Border of the Orbitar Plates of the Malar and Upper Maxillary bones.

It presents;—

1. **Sutures**—three—1. FRONTO-MALAR—externally; 2. FRONTO-MAXILLARY—internally; and 3. MALO-MAXILLARY—below:
2. **The Lachrymal Groove**—on the inner side continuous with the Naso-Lachrymal Canal below and traversed by the Naso-Lachrymal Suture:
3. **The Supra-Orbitar Hole** or **Notch**—above (transmitting nerve and vessels).

Frontal N. A & V.

The Apex—is represented by the Optic Hole, between the two Roots of the Lesser Wing of the Sphenoid; the Lesser Root supporting a Tubercle (for attaching a common tendon for three muscles of the eye). The two Optic Holes would meet at the Sella turcica, if prolonged backwards.

Internal, External & Inferior Recti M.

The Frontal, Sphenoid, Ethmoid and Upper Maxillary, with the Malar Lachrymal and Palate bones form this Fossa.

THE NASAL FOSSÆ.

These are two oblong irregular cavities, that are open both before and behind, and also on the sides leading into the Antrum and the Ethmoid cells. They are situated between the Base of the Skull and the Roof of the Mouth, having on the sides the cavities of the Orbit and of the Maxillary Sinus; and are separated from each other by a thin Septum between. They communicate with—(1.) the Frontal Sinus (through the Infundibulum); (2.) the Sphenoidal Sinus (through a hole in the Sphenoidal Turbinated bone); (3.) the Orbit (through the Naso-Lachrymal canal); (4.) the Mouth (by the Anterior Palatine canal); (5.) the Cranium (by the Olfactory Holes) and (6.) with one another (at times through a hole in the Septum). Each Fossa has—

Walls—four:—

I. Upper or **Vault**—long, narrow and concave from before backwards, and formed of three portions:—

1. **The Posterior** or **Sphenoidal portion**—which is the widest, sloping downward and backward, and is laterally concave and longitudinally convex. It is formed by the under surface of the Body of the Sphenoid, with the Wing of the Vomer behind and the Sphenoidal Turbinated in front; presenting the—
    1. **Orifice of the Sphenoidal Sinus**;
    2. **Suture** of the Vomer with the Sphenoid;
    3. **Suture** of the Sphenoid with its Turbinated bone:
2. **The Middle** or **Ethmoidal Portion**—which is horizontal and narrow, and is formed by the Cribriform Plate of the Ethmoid. It is bounded by the Ethmo-Frontal Suture in front and the Ethmo-Sphenoidal Suture behind, and by the Vertical plate of the Ethmoid internally and its Lateral Mass externally. This portion presents only the **Olfactory Holes**.
3. **The Anterior** or **Nasal Portion**—which is formed by the Nasal bones and is wider like the Posterior portion, but sloping downwards and forwards. It is bounded externally by the Naso-Maxillary suture, internally by the Nasal Crest and Spine, and behind by the Naso-Frontal Suture; thus presenting the—
    1. **Internal Nasal Groove**—(for the passage of a
Internal Nasal N. | nerve);
    2. **Vascular Apertures**—for small vessels:

II. Lower Wall or **Floor**—short, wide and laterally cancave, being widest at the middle and longest internally; and formed by the Palatine Plates of the Upper Maxillary and Palate bones, presenting the—

1. **Crest** for the Vomer, internally;
2. **Upper Orifice** of the anterior Palatine canal—in
Anterior Palatine N. | front;
3. **Transverse Suture**—between the Horizontal Plates of the Maxillary and Palate bones.

III Inner Wall or **Septum**—formed by the Vertical Plate of the Ethmoid at the middle, with the Vomer behind, the Nasal Spine (of the Frontal) and Crest (of the Nasal) in front, and the Crest of the Maxillary and Palate bones below. It is often deflected on one side and presents—

Olfactory N. | 1. **Vascular and nervous furrows** ;

2. **A triangular Notch**—in front, (which is filled up
Triangular C. | with a cartilage of the Nose);

3. **Oblique Apertures** of a few Olfactory holes—at the upper part.

IV. Outer Wall—very uneven and formed by the Inner Surface of the Upper Maxillary with the Lateral Mass of the Ethmoid above, the Vertical Plate of the Palate bone behind, and the Lachrymal with the Nasal Process of the Upper Maxillary in front. It is divided by the three Turbinated (horizontal) bones into three horizontal channels:—

1. **The Inferior Meatus**—broader before, open at each end and below, and formed externally by the Maxillary and Palate bones, and internally and above by the Inferior Turbinated bone. It presents the—

Lower Orifice of the Naso-Lachrymal Canal—at the front part of its Outer Wall, which is formed by the Upper Maxillary with the Processes of the Lachrymal and Inferior Turbinated bones; and is somewhat compressed from side to side, is narrowest at the middle, and curving out-
Nasal Duct. | wards above. (It transmits a duct).

2. **The Middle Meatus**—also broader before and open at each end and below, but shorter, occupying only the middle half of the Outer Wall; and formed above and internally by the Middle Turbinated bone of the Ethmoid, below by the upper aspect of the Inferior Turbinated bone, and externally by the inner aspect of —(1.) the Nasal process, (2.) the front portion of the Lachrymal, (3.) the Ethmoid cells and the Maxillary Sinus, and (4.) the Vertical Plate of the Palate bone. It presents—

1. **The Lower Orifice of the Infundibulum**—anteriorly, communicating with the anterior Ethmoid cells and terminating at the Frontal Sinus;

2. **The Entrance of the Antrum**—externally, contracted by the Ethmoid above, the Inferior Turbinated below, the Palate bone behind, and the Processes of the Lachrymal and Inferior Turbinated bones in front;

3. **Sutures**—(1.) between the Maxillary and Lachrymal (the vertical and horizontal—both); (2.) between the Lachrymal and Ethmoid; (3.) between the Ethmoid and Maxillary; and (4.) between the Maxillary and Palate bones.

Contd.—**3. The Superior Meatus**—open only behind and below, but closed in front by the anterior Ethmoid cells. It is very short and small, and is situated posteriorly; being formed—above by the floor of the posterior Ethmoid cells, internally by the Superior Turbinated bone (of the Ethmoid), and externally by its Lateral Mass with the Neck of the Orbitar Process of the Palate bone behind; presenting the—

1. **Opening of the Posterior Ethmoid Cells**—at the front part of the Upper wall;
2. **Spheno-palatine Foramen**—at the back part of the Outer wall.

The Nasal Fossæ are formed by the Nasal, Upper Maxillary, Lachrymal, Ethmoid, Palate, and Inferior Turbinated bones, with the Sphenoid, Sphenoidal Turbinated, Vomer, and the Frontal.

THE TEMPORAL FOSSÆ.

The posterior and inferior portions of these we have already seen (in p. 74) to be formed by the Greater Wing of the Sphenoid. Each of them is completed below and anteriorly by the upper part of the Malar bone, and is over-arched below and externally by the—

Zygomatic Arch—an arch formed by the Processes of the Temporal and Malar bones, and wider in front; being convex externally and traversed by the Temporo-Malar Suture. This Arch limits the Temporal Fossa, and encloses an empty space on the side of the Cranium, (which is filled up with a muscle in *Temporal M.* | the recent state).

The Temporal fossa is formed by the Temporal, Parietal, Frontal Sphenoid and Malar bones; and is separated from the Zygomatic Fossa by the Horizontal crest on the Greater Wing of the Sphenoid and Temporal bones.

THE ZYGOMATIC FOSSÆ.

These are irregularly shaped, and are bounded—behind by the Posterior Border of the External Pterygoid Plate, in front by the Malar Ridge of the Upper Jaw, below by the Alveolar Border of the Superior Maxillary bone, and above by the HORIZONTAL RIDGE passing forwards from the Root of the Zygomatic Arch, across the Temporal and Greater Wing of the Sphenoid. Each of these Fossæ is divided into two portions; and presents—

1. **The Pterygo-Maxillary Fissure**—a vertical triangular opening situated at about the middle, dividing the Fossa into two portions and meeting at the upper part the Spheno-maxillary Fissure at a right angle. It is formed by the divergence of the Maxillary bone from the Pterygoid Process, forming thus a communication between the Zygomatic and the Spheno-maxillary Fossæ.
2. **The Anterior Portion**—large and convex, and formed by the Posterior Surface of the Upper Maxillary bone ; presenting the—

   Orifices—two or three—of the Posterior Dental Canals ;
3. **The Posterior Portion**—small and concave (attaching muscle), and formed above by the base of the Greater Wing of the Sphenoid, and below by the Pterygoid Process with a portion of the Tuberosity of the Palate bone.

   External Pterygoid M.

THE SPHENO-MAXILLARY FOSSÆ.

These are small triangular spaces, situated vertically, and suspended, one on each each side as it were, from behind the Apex of the Orbit Each of them is the meeting point of three diverging Fissures—the Sphenoidal, Spheno-maxillary and the Pterygo-maxillary; and presents—

1. **The Upper Wall** or **Base**—formed by a portion of. the Under Surface of the Body of the Sphenoid, whence the three Fissures diverge ; thus—

   1. The **Sphenoidal**—going obliquely outwards above, (and transmitting nerves with a small vein) ;

   3rd, 4th, 6th & Opthalmic of 5th N.

   2. The **Spheno-Maxillary**—going obliquely forwards at the middle, (and transmitting other nerves and vessels) ;

   Two ascending from Spheno-palatine & 3 Dental from Infra-Orbitar N. Infra-orbitar A. & V. from Internal Maxillary.

   3. The **Pterygo-Maxillary**—passing vertically downwards below, (and transmitting vessels):

   Internal Maxillary A. & V.

2. **The Posterior Wall**—formed by the front aspect of the Pterygoid process, and presenting three Orifices :—

   (1.) The **Foramen Rotundum**—its Anterior Opening—(transmitting a nerve) ;

   Upper Maxillary N.

   (2.) The **Anterior aperture of the Vedian Canal**—(transmitting vessels and nerves) below and immediately internal to the above ;

   Vidian A. V. & N.

   (3.) The **Anterior aperture of the Pterygo-Palatine Canal**—(transmitting after vessels and nerves) still internally and below :

   Pterygo-Palatine A. V. & N.

3. **The Anterior Wall**—formed by the Posterior Border of the Upper Maxillary;

4. **The Inner Wall**—formed by the Outer aspect of the Vertical Plate of the Palate bone, showing the—

Spheno-Palatine Foramen—which forms a communication
Spheno palatine A. V. & N. between this Fossa and the Nasal, (and transmits vessels
Spheno-palatine or Meckel's G. and nerves, besides lodging a nervous ganglion):

5. **The Outer Wall**—being wanting, to form the Pterygo-Maxillary Fissure;

6. **The Apex**—being the lower end of the Fossa, and formed by the meeting of the Pterygoid Process with the Tuberosity of the Upper Maxillary bone. It is perforated by the upper openings of the—

Posterior Palatine Canals—the LARGE with two or three
Posterior Palatine A. V. & N. ACCESORY ones—(which transmit vessels and nerves).

The Sphenoid, Upper Maxillary and Palate bones form this Fossa: and it communicates with the ORBITAR FOSSA through the Sphenoidal Fissure; with the NASAL FOSSA through the Spheno-Palatine Canal; with the ZYGOMATIC FOSSA through the Pterygo-Maxillary Fissure; and with the CRANIUM through the Foramen Rotundum.

THE CRANIO-FACIAL SUTURES.

These are the Sutures formed between the Facial and Cranial bones, and are not many. They are classified, according to their situation, into—

I. **Septal**—which are situated in the median Septum of the Nose; these are—

1. The Alæ Vomeral—horizontal, at the upper and back part;
2. The Ethmo-Vomeral—oblique, along the middle;
3. The Vomero-Palatal—horizontal, along the lower part;
4. The Ethmo-Nasal—oblique, at the upper part in front:

II. Nasal--which are situated in the Nasal Fossæ; of these—

1. **Upper Nasal**—in the Nasal Notch of the Frontal bone, and horizontal, comprise two—
   - (1.) **The Fronto-Nasal**—formed by the Upper Border of the Nasal bone;
   - (2.) **The Fronto-Maxillary**—formed by the Upper Border of the Nasal Process of the Upper Maxillary:
2. **Outer Nasal**—in the Outer Wall of the Nasal Fossa, are also two—
   - (1.) **The Pterygo-Palatine**—vertical, between the Vertical Plate of the Palate bone and the Pterygoid Process;
   - (2.) **The Ethmo-Turbinated**—horizontal, between the corresponding Processes of these two bones:

III. Orbital—which are situated in the Orbitar Fossæ; these are—

1. **Internal Orbital**—in the Inner Wall of the Orbit; which are—
   - (1.) **The Fronto-Lachrymal**—horizontal, (between the Lachrymal and Frontal bones);
   - (2.) **The Ethmo-Lachrymal**—vertical;
   - (3.) **The Ethmo-Maxillary**—horizontal:
2. **External Orbital**—in the Outer Wall of the Orbit; which are—
   - (1.) **The Fronto-Malar**—horizontal;
   - (2) **The Spheno-Malar**—vertical:

IV. Zygomatic—situated in the Zygomatic Arch; which is only one—

The Temporo-Malar—oblique and beveled, between the Zygomatic Processes of these two bones.

The Fœtal Face differs from **The Adult Face**:—

The Fœtal Face—having the—	while the Adult Face having the—
Middle Region—small, owing to the Maxillary Sinuses not being developed;	**Middle Region**—large, from development of the Maxillary Sinuses;
Lower Region—less extensive vertically, but more prominent; containing the Teeth within the Alveolar Arches; and making the Angle of the Jaw very obtuse;	**Lower Region**—more extensive vertically, from development of the Teeth, rendering the Angle of the Jaw thereby less obtuse;
Orbit and **Forehead**—nearly mature, and therefore appearing too large for the other parts:	**Orbit** and **Forehead**—in exact proportion to the rest.

A GENERAL VIEW OF THE WHOLE SKULL.

As the Cranium contains the organs of Intellect, so the Face the apparatus of Sense'; consequently the relative development of the Mental and Physical faculties, in different persons and animals, is always indicated by the relative proportion of these two divisions of the Skull. This proportion is best measured by an Angle, formed by a line representing tho profile (or inclination) of the Nose, with the line representing the plane of the Cranium (that is by a line drawn from the Occipital Protuberance to the Root of the Nose). And, as the abruptness of the angle formed by this line with the axis of the Vertebral Column, represents the intellectual development of an animal, so the breadth of the angle formed by the Nasal line with a line indicating the Prominence of the Jaws (that is by drawing one from the Root of the Nose to the prominence of the Upper Jaws) shows a predominance of the organs of animal life over those of the merely vegetable functions; and consequently indicates a decided improvement in the shape of the head: thus—

I. **The Caucasian Skull**—which is the most perfect, with the Cranium rounded and symmetrical, (the proportion of the part in front of the Foramen Magnum, to the part behind, being as 2 to 3); and the Face oval and nowhere strikingly prominent (its area being as 1 to 4 of the Cranium):

II. **The Ethiopian** or **African Skull**—which is laterally compressed; with the Cranium narrow and elongated, the Temporal Fossa being large and the Ridge very prominent; and the Face narrowed—with the Cheek-bones, Jaws and Incisor teeth very prominent:

III. **The Mongolian** or **American Skull**—which is laterally large; with the Cranium broad and square, and the face flat and square; (the Cheek-bones and Zygomatic Arches projecting very much laterally;—the Nose scarcely prominent, with its bridge very wide; and the Jaws and Dental Arches very wide and little convex:

IV. **The Fœtal Skull**—with ossific centres large and prominent, and nutrient holes very numerous, has the—

Cranium—large, with bones imperfect, several parts (like the Styloid Process) remaining even separate; the Mastoid Process, Auditory Meatus, and the differrent Sinuses undeveloped;—the Sphenoid and Frontal bones, each in two pieces, the Occipital in four, and the Temporal in five The Vault bones are thin and none in contact with each other; and the Angles of the Parietal bones, being undeveloped, leave six membranous spaces, called Fontanelles; of which the median two are the largest—one at each end of the Sagittal Suture—the front one being square and large and the back one small and triangular. These are filled up towards the fourth year of life:

Face—deficient in the Sinuses, and therefore small.

Structure and Uses.—The Skull being placed on the top of an elastic column, within the range of the two upper limbs for its protection, is best adapted to contain the most delicate organization of the brain and its dependencies. It is an egg-like dome, with walls tough externally, spongy in the middle, and very dense and hard within ; having four very strong wedges forming its floor, which converge towards the centre and hold each other in an yielding way by the intervention of plates of Cartilage; viz :—the Sphenoid in front, the Basilar Process behind and the Petrous bones on each side ; while the roof is made up ‘ of broad bones, alternately over-lapping and over-lapped at the borders, and united with each other by strong inter-locking teeth, and prevented from starting outwards by the ascending portions of the Temporal and Sphenoid bones'. This last, curving its Greater Wings upwards and binding together the sides of the vault, while its Pterygoid Processes holding the lateral divisions of the Face, well deserves the name of the KEY-BONE of the Skull. The Skull is strengthened by thick Tuberosities at all the exposed parts ; besides there are two strong Ridges passing vertically and horizontally round it, and crossing each other at right angles at the Occipital Protuberance. These correspond to certain Fissures of the brain, and consequently through them any remains of outward concussion can be transmitted without much injury to the substance of this vital organ.

CHAPTER V.—THE EXTREMITIES.

These are the four jointed appendages of the body, which are attached (in pairs), by their upper ends, to the sides of the two (upper and lower) extremities of the Trunk ; thus—

I. The Upper Extremities—which are suspended from the sides of the upper part of the Thorax, and chiefly meant for tact and prehension;

II. The Lower Extremities—which are connected with the sides of the Pelvis, and chiefly meant for support and locomotion.

N. B.—The Jaws are reckoned by some as a third pair of extremities connected with the Cranium.

I. THE UPPER EXTREMITY.

This is divided into 4 parts :—

1. **THE SHOULDER**—consisting of two bones—the SCAPULA and the CLAVICLE ;
2. **THE UPPER ARM**—consisting of only one bone—the HUMERUS ;
3. **THE FOREARM**—consisting of two bones—the RADIUS and the ULNA ;
4. **THE HAND**—consisting of twenty-seven bones.

1. THE SHOULDER—

Which is composed of two bones, that are more legitimately to be included among the Costal group. These are—

(1.) THE CLAVICLE—which is articulated to the upper part of the front of the Chest-wall ;

(2.) THE SCAPULA—which is connected with the back part of the Thorax.

I. THE CLAVICLE—OR THE COLLAR BONE.

It is situated almost horizontally, passing obliquely across the 1st Rib, and articulated on the one side with the Upper Border of the Sternum, and on the other with the Acromion Process of the SCAPULA. It is slightly twisted on its axis, and is prismatic in its inner three fourths but flat in its outer quarter: and it has a double curve, presenting a convexity forwards in its inner part, and again a concavity forwards in its outer part.

I. The Flat or the Outer Portion—

which is only a quarter of the bone, situated between the Coracoid and Acromion Processes of the Scapula, and which is concave anteriorly, presenting—

Surfaces—two—

Deltoid & Trapezius M.

Superior—concave and rough (and covered by the aponeurosis of two muscles);

Inferior—uneven, having—

Conoid L.

1. **The Tuberosity**—situated behind, just at the junction of the Flat and Prismatic portions and immediately above the Coracoid Process of the Scapula, (and attaching a ligament);

Trapezoid L.

2. **The Oblique Line**—passing obliquely from the Tuberosity outwards and forwards, (and attaching another ligament);

Borders—also two—

Deltoid M.

Anterior—thin, concave and rough (for attaching a muscle);

Trapezius M.

Posterior—very thick, convex and rough (for attaching another muscle);

II. The Prismatic or the Inner Portion—

which is about three-fourths of the bone, situated between the Sternum and the Coracoid Process of the Scapula, and which is curved, being convex in front, and is slightly twisted on its axis, presenting—

Surfaces—three—

1. **Anterior**—convex, and directed forwards internally but upwards externally, where it becomes continuous with the Upper Surface of the Flat Portion. It presents—

   Sterno-mastoid M.

   1. **A Rough Impression**—internally, (for attaching a muscle);

   Platysma M. N. from Cervical Plexus.

   2. **A Smooth Surface**—externally, which is subcutaneous (and covered by a very thin muscle with some nervous branches);

Contd.—2. **Posterior**—concave and smooth internally (protecting the vessels and nerves of the neck), and continuous externally with the Posterior Border of the Flat Portion; and presenting the—

Brachial Plexus N. Sublavian A. & V.

Hole—for the nutrient artery—at the outer part:

3. **Inferior**—rough and wider externally, to become continuous with the Inferior Surface of the Flat Portion, and presenting—from within outwards—

(1.) A little Facet—smooth, for articulation with the First Costal cartilage;

Costo clavicular L.

(2.) The Rhomboid Impression—rough (for attaching a ligament);

Sub-Clavius M. Ap. of Sub-Clavius M.

(3.) The Subclavian Groove—running longitudinally and widening outwards (for attaching a muscle); (its anterior lip attaching an aponeurosis):

Borders—three, separating the three Surfaces of the Prismatic portion:—

1. **Superior**—rounded, and indistinct internally, but externally becoming continuous with the Posterior Border of the Flat Portion;

2 **Anterior**—rough internally (for attaching a muscle), and continuous externally with the Anterior Border of the Flat Portion (where it gives attachment to another muscle);

Pectoralis Major M. Deltoid M.

3. **Posterior**—very indistinct, extending from the Rhomboid impression to the Tuberosity.

III. Extremities—two—

1. **Inner** or **Sternal**—large, showing—

(1.) **A Triangular Articular surface**—which is concave from before backwards and convex from within outwards, and which is directed downwards, inwards and forwards, to be articulated with the Manubrium (of the Sternum) by the intervention of a Fibro-cartilage; and which presents—

Interarticular C.

Angles—three—

1. POSTERIOR INFERIOR—very much prolonged down-wards and backwards, so as to increase the Surface considerably in this direction;
2. SUPERIOR—attaching the fibro-cartilage of the joint;
3 ANTERIOR INFERIOR—not at all remarkable

(2.) **A rough Border**—around the Articular Surface

Anter & Poster. Sterno-clavicular & Inter-clavicular L.

(for attaching ligaments.)

Contd.—**2. Outer** –small, presenting—

A small Articular surface—which is oval and directed forwards and outwards, to articulate with the Acromion Process of the Scapula; (its borders giving attachment to ligaments.)

Superior & Inferior Acromio-clavicular L.

[**Structure**.—Like the ribs, it is cellular and elastic both in the Shaft and in the Extremities; and again like the long bones, it is invested by a compact layer, which is thicker at the middle and contains a small medullary canal.

Articulation—with the First bone of the Sternum and the First Costal Cartilage on the one hand, and the Scapula on the other.

[**Development**—mainly from one point of ossification, appearing before any other bone of the body. Epiphyses are developed subsequently for the extremities, by the 19th year of life, which afterwards become joined to the Shaft.

N. B.—The Clavicle is a very elastic bone, possessing so much longitudinal elasticity as to throw its own weight two feet outwards, and sufficient transverse elasticity opposite the centre of its Anterior Convexity as to throw the same weight one foot forwards.

2. THE SCAPULA OR THE BLADE-BONE.

It is a large, flat and triangular bone, lying over the first seven ribs at the back, and having two large Surfaces, three stout Borders and three Angles; of which last the External one is remarkably large, forming what is called the Head of the bone, which is supported on a contracted portion that is called the Neck. Besides, there are three Processes;—one, the Coracoid ascends from the Neck, and one, the Spine passes across the back, while the third, the Acromion springs from the outer end of this last to over-hang the head.

A. Surfaces—two—

1. Posterior—or the **Dorsum,** which is convex vertically, but alternately concave and convex transversely, presenting the—

Spine of the Scapula—which is a strong triangular plate, projecting from the line of junction of its upper quarter with the lower three-fourths and having the Apex inward and the Base outwards and not quite reaching the External Border of the bone. It presents—

Surfaces—two—

1. Superior—concave and rough, contributing to form the Supra-Spinous Fossa (and attaching a muscle;) — *Supra-Spinatus M*
2. Inferior—also concave, to form the Infra-Spinous Fossa (and attaching another muscle): — *Infra Spinatus M*

Contd.— **Borders**—three, of which the—

1. Anterior—is continuous with the Dorsum and is the Root of the Process;
2. External—is short, thick and rounded, disappearing on the Neck of the bone on the one hand and spreading out on the Under surface of the Acromion Process on the other;
3. Posterior—forms the **Crest** and is wide, presenting—
   - (1.) Two lips—which are continuous externally with the two Borders of the Acromion Process, but which internally join the Base of the Scapula and there enclose a triangular Space that is smooth (for the *Of the Trapezius M.* | gliding of a tendon);
   - (2.) An Interval—which is subcutaneous and narrow at the middle—getting wider at the ends :

Angles—three—

Internal—supporting the triangular Space at the base;

Anterior—continuous with the Neck of the bone;

Posterior—most prominent and supporting the Acromion Process :

Acromion Process—that springs from the Posterior Angle of the Spine, and passes outwards for a short space, and then goes upwards and forwards to arch over the Glenoid cavity. It is flattened like the Spine but in the opposite direction, presenting—

(1.) **Surfaces**—two, which are at right angles to the Surfaces of the Spine; thus—

Upper—convex and subcutaneous, forming the top of the Shoulder and becoming continuous with the Interval of the Crest;

Lower—smooth and concave, to protect the Shoulder-joint :

(2.) **Margins**—two, of which the—

External—is thick and tubercular, (attaching a *Deltoid M.* | large muscle);

Internal—is thin and concave, (attaching a second *Trapezius M.* | muscle), and supports—

An oval Articular surface—near the summit, for articulation with the Clavicle;

(3.) **Summit**—or the tip of the Process, which is thin *Coraco-Acromion L.* | and rough (for attaching a ligament) :

Supra-Spinous Fossa—which is formed by the Upper Aspect of the Spine and the Upper Portion of the Posterior Surface, and is smooth and concave, and wider internally, (being filled up by a muscle, *Supra-Spinatus M.* | that takes origin from its inner two-thirds);

Contd.—**Infra-Spinous Fossa**—which is formed by the Lower Aspect of the Spine and the Lower Portion of the Posterior Surface, and is thrice the size of the Supra-Spinous Fossa (and is mainly filled with another muscle, that rises from its inner three fourths,)
Infra-Spinatus M. | and presents—from without inwards—

(1.) **An elongated Surface**—which is on a higher level—along the Outer Border, and has a prominent Line passing obliquely from the Outer Border across the lower part of this Surface and dividing it into two portions ;—

UPPER PORTION—being long and narrow (and at-
Teres minor M. | taching one muscle) ;

LOWER PORTION—being wide (and attaching an-
Teres major M. | other muscle):

(2.) **A Rough Line**—running parallel to the Outer Border, and bounding the Elongated Surface internally. This meets the Inner Border about an inch above the Lower Angle (and attaches an intermuscular aponeurosis) ;

(3.) **A Groove**—running parallel to the Rough Line ;

(4.) **A broad Convexity**—parallel to this last :

(5.) **A narrow Concavity**—situated above and internally :

II. Anterior Surface—(or the **Venter** of the Scapula) presenting—

1. A Narrow Surface—along the Internal Border, which is wide above and below, but often wanting at the middle, (attaching by its entire length a very large
Serratus Magnus M. | muscle) ;

2. The Subscapular Fossa—somewhat oval in shape and very large, being traversed internally by several rough and oblique lines, and being throughout concave (and occupied by a muscle that takes origin from its
Subscapular M. | inner two-thirds) and presenting the—

Subscapular Angle—at the bottom, which is a mere depression along the course of the Spine on the back.

B. Borders—called the Costæ—which are three—

1. External or **Axillary**—which is the thickest of all, becoming thinner at the lower part, and presenting—

1. **A Depression**—at the upper third (for attaching
Triceps M. | one muscle) ;

2. **A Groove**—at the middle third (for attaching a
Teres minor M. | second muscle) ;

3. **An Edge**—at the lower third (for attaching a third
Teres major M. | muscle):

2. Superior—shortest and thinnest, (attaching a small muscle and) presenting the—

Omohyoid M.

Supra-scapular Notch—or Hole—externally, at the root of the Coracoid Process (for the passage of a nerve, with vessels at times);

Supra-Scapular N. A. & V.

3. Internal or **Vertebral**—often called the **Base** of the Scapula. It is the longest border, presenting an obtuse Angle at the situation of the Spine (and gives attachment to six muscles;—

Serratus magnus M. | THE ANTERIOR LIP—to one,

Supra & Infra-spinatus M. | THE POSTERIOR LIP—to two,

Levator Anguli, Rhomboideus minor & major M. | THE INTERVENING SPACE—to three.)

C. Angles—three—

1. Inferior—thick and rough (attaching two muscles);

Teres major & Latissimus dorsi M.

2. Superior Posterior—thin and rounded, being the highest point of the bone (and attaching a muscle);

Levator anguli Scapulæ M.

3. Superior Anterior—very thick and truncated, forming the Head of the bone, which supports the Glenoid cavity, that articulates with the Arm-bone

D. The Head—which occupies the External Angle and supports—

The Glenoid Cavity—a large, shallow and ovoid articular depression, which is wide below, and elongated from above downwards and backwards, and is directed forwards, outwards and downwards, to articulate with the Head of the Arm-bone · (Its Margins give attachment to a ligament, and its Summit fixes the tendon of a muscle.)

Capsular L. of Shoulder. Long head of Biceps M.

E. The Neck—which is the contracted portion that supports the Head and is more marked behind and below. From its upper part springs—

Contd.—**The Coracoid Process**—which is like a half-bent finger, pointing outwards and forwards. It rises by a strong root, from the upper border of the Neck, and goes at first upwards and inwards, and then changes its direction outwards and forwards; and thus it presents two portions—

1. **The Ascending Portion**—which is broad and flat from before backwards;
2. **The Horizontal Portion**—which is narrow and flat from above downwards, having—
   1. An Upper Surface—rough
      Conoid L. behind & Trapezoid L. in front. | (for attaching two ligaments);
   2. A Lower Surface—smooth and arching over the Glenoid cavity;
   3. An Anterior Margin—rough (for attaching a
      Pectoralis minor M. | muscle);
   4. A Posterior Margin—also rough (for attaching a ligament);
      Coraco acromion L. |
   5. An Apex—tubercular
      Coraco brachialis & short head of Biceps M. | (for attaching two muscles);
   6. An Angle—between the Ascending and Horizontal portions, (for giving attachment to a ligament).
      Supra-scapular L. |

[**Structure**—cellular at the Head and Processes, and compact in the rest of its extent. The Ala is almost transparent.

Articulation—with the Clavicle by an Arthrodial joint; and with the Humerus by Enarthrosis. It is strongly supported on the ribs, by several very strong muscles

[**Development**—incomplete **at birth**;—the bone being a single piece which appears about the time of ossification of the vertebræ, and forms the main bulk of the bone, with the exception of the Coracoid and Acromion Processes and the Lower Angle and Base. The bone is not completed before the 25th year, when the other portions are developed; thus—

The Coracoid Process—begins to ossify in the first year, and joins the main portion between the 15th and 17th years, when the other epiphyses appear;—

The Acromion-Epiphysis—from two or more points;

The Coracoid Epiphysis—commencing at the Angle of the Process;

The Lower Angle Epiphysis—forming that portion of the Base too;

The Base Epiphysis—forming the rest of the Base.

THE SHOULDER IN GENERAL.

The horizontal Clavicle with the vertical Scapula forms the SHOULDER, which is the basis of support for the Arm. It is so far peculiar that the Scapula, which is the real support for the Humerus, is simply kept applied to the Chest-wall, the only point of bony or articular connection being at the tip of the Acromion Process, by an arthrodial joint, with the outer end of the curved and twisted Clavicle, that itself is again so loosely connected with the first piece of the Sternum, as to allow of motion both antero-posteriorly and laterally. It is indeed a moveable fulcrum for the Arm, which allows an admirable freedom of motion, and, at the same time, by its peculiar conformation, neutralizes much of the force of concussions, to which the Upper Extremities are so liable. It is the situation of this fulcrum at the upper part of the Chest, that gives the outward contour of it as being broader above than below, whereas in reality the Chest-Cavity is much wider below than above.

THE HUMERUS OR THE ARM-BONE-

which is the longest and largest bone of the Upper Extremity, and is cylindrical above, twisted in the middle and prismatic below, presenting two Extremities and a Shaft between ;—

A. Extremities—two, of which the—

I. Superior—is large and strong, presenting the—

1. Head—which is globular and smooth, looking upward, inward and backward, having an UNEVEN CIRCUMFERENCE and being supported on a contracted portion, which is called the—

Neck—(anatomical †)—which is very short above, but is long and oblique below, (and attaches a ligament by its entire circumference);

Capsular L. of Shoulder-joint.

2. Tuberosities—two—

1. Greater—which is external, broad and convex, and has the upper aspect divided into THREE FLAT FACETS—

Supra-Spinatus M. | ANTERIOR facet—(attaching one muscle);

Infra-Spinatus M. | MIDDLE facet—(attaching another muscle);

Teres minor M. | POSTERIOR facet—(attaching a third muscle);

2. Lesser—more prominent and tubercular (for the attachment of a muscle), and situated in front of and internal to the Greater Tuberosity, from which it is separated by the Bicipital Groove—a vertical groove (for the passage of a tendon) :

Subscapularis M.

Long head T. of Biceps M.

II. Inferior—is curved forward and flattened antero-posteriorly, having Projections surmounting the Articular surface on the sides, and presenting—

---

† To distinguish it from the Surgical Neck of the Humerus, which is situated just below the Tuberosities and is so liable to fractures.

Contd.—**1. An Articular Surface**—which is longest transversely and sloping considerably downward internally, and is divided by a narrow Groove into two portions ;—

1. **The Lesser Head**—or the **Radial Tuberosity,** which is outer and situated somewhat in front, and is small and globular, for articulation with the Head of the Radius, and is bounded internally by the narrow GROOVE, that corresponds to the inner margin of that Head ;

2 **The Trochlea**—which exists all round the end of the bone—below, in front and behind, showing mainly—

A BROAD GROOVE—which is wider and deeper behind, and is embraced by the Sigmoid Cavity of the Ulna ;

THE OUTER MARGIN—(of this) being narrow and not prominent, while

THE INNER MARGIN—is very thick and prominent, so as to cause the remarkable descent of this Extremity on this side :

2. The Condyles—which are two non-articular eminences, one on each side of this Extremity (for attaching muscles and ligaments) ; of these the—

Pronator Radii teres, Flexor carpi radialis, Palmaris longus, Flexor carpi ulnaris, Flexor sublimis digitorum M. and Internal Lateral L.	1. **External**—is flat and tubercular (and attaches, six muscles and a ligament);
Extensor carpi radialis brevior, Extensor communis digitorum, Extensor minimi digiti, Extensor carpi ulnaris, Anconeus & Supinator brevis M. & External lateral L.	2. **Internal**—is more prominent and large and slightly turned backwards (and attaches five muscles and a ligament) :

3. The Fossæ—which are three non-articular depressions, situated immediately above the Articular surface for receiving corresponding Prominences of the bones of Forearm ;—

1. **The Fossa Maxima**—or the **Olecranon Depression**—which is the largest, and is deep and triangular, being situated behind, just above the Trochlea, and receives the Olecranon Process of the Ulna during extension of the Forearm.

Contd.— 2. **The Fossa Anterior Major**—or the **Coronoid Depression**—which is also above the Trochlea, but situated in front, and is just opposite the Fossa Maxima behind, from which it is separated by only a thin lamina of bone, which at times is even deficient. This is the larger of the two Fossæ in front, and receives the Coronoid Process of the Ulna when the Forearm is flexed, (and its Borders give attachment to a ligament).

Capsular L.

3. **The Fossa Anterior Minor**—or the **Radial Depression**—situated also in front, but it is above the Lesser Head and is the smallest of the three Fossæ, and it receives the Head of the Radius in extreme flexion of the forearm.

B. Body or Shaft—which is prismatic, being flattened below, and cylindrical above.

It is twisted in the middle, so that its two Extremities have opposite directions. It presents three Surfaces separated by three Borders:—

I. Borders—three—

1. **Anterior**—extending from the front part of the Greater Tuberosity to the top of the Coronoid Fossa. It is rough and prominent above, forming the outer margin of the Bicipital Groove (and attaching a muscle); rough in the middle, forming the anterior boundary of the Deltoid impression, (and attaching part of another muscle); and rounded and smooth below, (where it is covered by a third muscle);

Pectoralis major M.

Deltoid M.

Brachialis anticus M.

2. **External**—extending from the posterior part of the Greater Tuberosity to the External Condyle. It is rough above (for attaching a muscle), grooved at the middle (for the passage of a nerve), and very prominent and curved forwards below, (where it attaches two muscles and an aponeurosis);

Outer head of Triceps M.

Musculo-spiral N.

Supinator radii longus & Extensor carpi radialis longior M. & External intermuscular Ap.

3. **Internal**—extending from the Lesser Tuberosity to the Internal Condyle. It is prominent above, forming the inner margin of the Bicipital Groove (and attaching three muscles); rounded at the middle; and very prominent and curved inward below (where it attaches an inter-muscular septum):

Teres major, Latissimus dorsi & Inner head of Triceps M.

Internal intermuscular Ap.

II. Surfaces—three—

1. **Posterior**—rounded above and looking slightly inwards; but flat and expanded below, where it looks somewhat outwards. (It gives attachment to a muscle by its upper and lower parts);

Triceps M.

Contd.—2. **Internal**—very narrow and looking forwards above, rough in the middle, and smooth below; presenting from above downwards—

1. **The Bicipital Groove**—formed by the approximation of the two Tuberosities at the upper end of the bone, and running downwards and inwards till it disappears above the middle. It is smooth and deep above, but gets shallower and broader below, (and transmits a tendon).

   Long head of Biceps M.

2. **The Coraco-brachial Impression**—about the middle, and rough (for attaching a muscle) and having the—Medullary Foramen—going obliquely downwards;

   Coraco-brachialis M.

3. **A smooth part**—below, (which attaches another muscle);

   Brachialis anticus M.

3. **External**—rounded and looking outwards above (where it is covered by a muscle); flat and turning more forwards below, (where it gives origin to a muscle); and presenting at the middle—

Deltoid M. Brachialis anticus M.

1. **The Deltoid Impression**—a triangular rough surface (for giving insertion to another muscle);

   Deltoid M.

2. **The Musculo-Spiral Groove**—which begins at the Posterior Surface and runs spirally round the Outer Border and Surface, immediately below the Deltoid Impression, and is shallow and smooth (for the passage of a nerve with an artery).

   Musculo-spiral N. & A.

[**Structure**—the Shaft is a cylinder of compact tissue, hollowed by the Medullary Canal: while the Extremities are masses of spongy substance, enclosed in a thin layer of compact tissue.

Articulation—with the Scapula above and with the Ulna and Radius below.

[**Development**.—A single piece at birth, as the Shaft; out of a cylindrical piece, appearing at the middle of the Shaft, in the 8th week of gestation, before the ossification of the Vertebræ, and soon after that of the Clavicle The two Extremities are then cartilaginous; and they are ossified after birth; thus—

I. **The Upper Extremity**—which remains separate up to the 20th year, is formed within the 5th year, from two or three pieces;—

1. The Head—from one point, appearing in the 2nd year;
2. The Greater Tuberosity—from another point, appearing during the third year;
3. The Lesser Tuberosity—from either a third point, or as an extension of the last one, after the 4th year:

II. **The Lower Extremity**—which unites with the Shaft, *before* the Upper Extremity, is formed about the 18th year, from two pieces;—

Contd.—1. The Articular Piece—from three points, which unite with each other after the 14th year, and join the Shaft by the 17th ;—

(1.) The Lesser Head—appearing in the third year;

(2.) The Trochlear Surface—appearing about the 12th year ;

(3.) The External Condyle—appearing in the 14th year :

2. The Inner Condyle—from one point, appearing in the 5th year, and joining the Lower Extremity of the bone (the Articular piece, already united to the Shaft) by the 18th year.

[**Mechanism & Uses**.—The shallowness of the (Glenoid) Cavity, on which the globular Head of the Humerus rolls ; and the nearness of its prominences to the Shoulder-joint, for attaching the muscles that move the Arm ; are admirably adapted to allow this a very extensive freedom with velocity of motion : while the over-hanging Acromion and Coronoid Processes so protect the joint as to obviate any chance of dislocation.

THE FOREARM--TWO BONES.

1. THE ULNA.

The longer and the inner of the two bones of Forearm. It is prismatic and curved, being convex outwards and backwards at the upper part and again inwards at the lower part ; and presents, like other Long bones, two Extremities and a Shaft between :—

I. **The Upper Extremity**—which is the strongest and thickest portion of the bone, presenting the—

1. **Olecranon Process**—a large, stout eminence, on the summit of the bone, which causes its greater length and forms the remarkable back prominence of the Elbow-joint. It is cuboidal in shape and somewhat contracted at the root, presenting five Surfaces (the sixth, forming the root, being fixed on the upper end of the Shaft) ; of these the—

1. Upper Surface—is quadrilateral and rough (for attaching a muscle) and bounded by a transverse Groove—in front, that runs along the Anterior Border of this Surface (and attaches a ligament) ;

Triceps M.
Posterior L. of Elbow.

2. & 3. Lateral Surfaces—are very narrow, forming each A Groove, that is continuous with the Groove on the Upper Aspect (and attaches the same ligament) ;

Posterior L. of Elbow.

Contd.—4. **Anterior Surface**—is smooth and cartilaginous, forming the upper part of the Great Sigmoid Cavity, and bounded by the Groove on the upper and lateral Surfaces ;

5. **Posterior Surface**—is triangular and subcutaneous :

2. **Coronoid Process**—a pyramidal eminence, projecting horizontally forwards, just below the Olecranon Process, and having the—

1. **Base**—fixed to the bone, at the root of the Olecranon Process ;

2. **Apex**—slightly curved upwards ;

3. **Upper Surface**—smooth and cartilaginous, and continuous with the Anterior Surface of the Olecranon—the two together forming the Greater Sigmoid Cavity ;

4. **Lower Surface**—called also the Anterior Surface, which is slightly concave and rough (for attaching a

Brachialis anticus M. | muscle), and is continuous with the Anterior Surface of the Shaft, from which it is separated by the—

Oblique L. of Elbow. | TUBERCLE of the Ulna—a small, rough eminence (for the attachment of a ligament) ;

5. **Inner Surface**—rough and concave (attaching two

Pronator radii teres & Flexor sublimis digitorum M. | muscles), and continuous below with the Inner Surface of the Shaft, and separated above from the Upper Surface of the Process by a—

Internal Lateral L. | TUBERCULAR RIDGE—which is prominent (for attaching a ligament of the Elbow-joint) ;

6. **Outer Surface**—narrow, presenting the—

Lesser Sigmoid Cavity (of Ulna)—which is narrow and flat from above downwards, but longer and concave from behind forwards—forming one-fourth of a circle, (and

Annular L. of Elbow. | attaching by its two ends a ligament, that completes the ring, within which the Head of the Radius turns) :

3. **Greater Sigmoid Cavity**—a large semi-lunar hollow formed by the Anterior Surface of the Olecranon with the Upper Surface of the Coronoid Process. It is concave from above downwards but convex from side to side, showing a longitudinal ridge that divides it into two lateral halves, of which the inner half is large and concave, and the outer small and plane. It is contracted at the middle, by two lateral Notches, that indicate the junction of the two Processes ; and it exactly fits into the Trochlear Surface of the Humerus.

II. The Lower Extremity—which is much smaller than the Upper Extremity, and presents—

1. The Head (of the Ulna)—a globular prominence, having—

1. **An Inferior Surface**—rounded, smooth and articular;

2. **An External Surface**—convex, lying along the Outer Border of the Lower Surface, and being also smooth and articular:

2. The Styloid Process—projecting downward from the inner and back part of the Head, and presenting at the root—

1. **A Rough Depression**—in front, between it and the Lower Surface of the Head, (for attaching a fibro-
Triangular C. | cartilage);

2. **A Vertical Groove**—behind and external, which is
Extensor carpi ulnaris T. | shallow (for the passage of a tendon), and marks the Process out from the rest of the bone.

III. The Shaft—which is prismatic above and rounded below, and tapers gradually downwards, presenting three Surfaces separated by three Borders;—

I. Borders—three—

1. External—commencing above by two roots, from the two ends of the Lesser Sigmoid Cavity, and terminating below above the middle of the External Articular Surface of the Head. It is arched and prominent at the middle,
Interosseous L. | (and attaches a ligament in its whole extent);

2. Anterior—commencing above at the inner margin
Flexor digitorum profundus & Pronator quadratus M. | of the Coronoid Process, and terminating below at the front of the Styloid Process, (and attaching two muscles);

3. Posterior—commencing above at the Apex of the tri-
Flexor digitorum profundus, Flexor carpi ulnaris & Extensor carpi ulnaris M. | angular Back Surface of the Olecranon, and terminating below at the root of the Styloid Process. It is prominent above, and flexuous in its course, (attaching the aponeuroses of three muscles):

II. Surfaces—three—

1. **Anterior**—looking slightly inwards, being wide and concave above, and narrow and convex below, and presenting—

Oblique L. |

(1.) **The Tubercle** of the Ulna—at the root of the Coronoid Process, (for attaching a ligament);

(2.) **The Medullary Foramen**—about the middle, running obliquely upwards;

Flexor profundus digitorum M. & Pronator quadratus M. |

(3.) **A Rough Portion**—above, and Another below—(for attaching muscles):

2. **Posterior**—looking backwards and outwards, being wide and concave above and getting wider at the middle and again narrow at the lower part, and presenting—

Supinator brevis M. |

(1.) **The Oblique Line**—a ridge, passing from the back part of the Lesser Sigmoid Cavity downwards and backwards, to join the Posterior Border, (attaching a muscle and) dividing this Surface into two portions;

Anconeus M. |

(2.) **The Triangular Portion**—above the Oblique Line, which is small (for attaching another muscle);

(3.) **The Trapezoidal Portion**—which is large and long, lying below the Oblique Line and presenting—

1. A Longitudinal Ridge—along the middle, dividing this Portion again into two parts;

Extensor ossis metacarpi pollicis, Extensor primi internodii pollicis, Extensor secondi internodii pollicis, & Extensor indicis M. |

2 An External Part—which is wider and concave (and gives attachment to four muscles);

Extensor carpi ulnaris M. |

3. An Internal Part—narrow (giving attachment to only one muscle) at the middle:

Flexor digitorum profundus M. |

3. **Internal**—looking inwards and backwards, being broad and concave above (where it gives attachment to a muscle), and narrow and rounded below—where it is subcutaneous.

[**Structure**—like all Long bones. The Olecranon may be regarded as a separate bone like the Patella.

Articulation—with the Humerus above, with the Cuneiform bone (of the Carpus) below (by the intervention of a fibro-cartilage), and with the Radius on its (outer) side both above and below.

[**Development.**—A single piece at birth for the Shaft, appearing about the 40th day of fœtal life. The two Extremities are formed about the 6th year after birth;—

The Lower Extremity—from a point appearing at the middle of the Head, about the 4th year, and extending into the Styloid Process, and joining the Shaft about the 20th year;

The Olecranon—as an extension from the Shaft, about the sixth year;

An Upper Epiphysis—for the top of the Olecranon, appearing about the 10th year, and joining the rest of the bone by the 16th.

N. B.—The Lower Extremity *ossifies* first; but the Upper *unites* with the Shaft before the Lower Extremity.—This law, that the Epiphysis that ossifies earlier is the later of the two in uniting with the Shaft, is common to all the Long bones.

---

2. THE RADIUS-

Which is the shorter and outer of the two bones of the Forearm. It is broader below than above, and is prismatic, being slightly curved, so as to have a general convexity outwards, and presenting, like other Long bones, two Extremities and a Shaft:—

I. The Upper Extremity—small, and consisting of—

1. **The Head**—which is the expanded articular summit of the bone, having—

   (1.) **A cup-like Depression**—on the upper aspect, which is smooth for articulation and receives the Lesser Head of the Humerus;

   (2.) **A smooth Cartilaginous Circumference**—which is broader on the inner side for articulation with the Lesser Sigmoid Cavity of the Ulna, but narrow in the rest of its extent (where it is embraced by a ligament): *Annular L.*

2. **The Neck**—that is the constricted portion immediately below the Head. It is the most slender part of the bone and is round (and surrounded by a ligament); *Annular L.*

3. **The Bicipital Tuberosity**—situated on the inner and fore part of the root of the Neck, and divided into two portions, of which the anterior is smooth and the posterior rough (for attaching a muscle). *Biceps M.*

II. The Lower Extremity—large and quadrilateral, presenting—

Surfaces—five—

1. **Inferior** or **terminal**—which is concave, smooth and triangular; and divided by an antero-posterior Ridge into two portions, for articulation with the outer two bones of the First Row of the Wrist;—

   EXTERNAL PART—triangular, articulating with the Scaphoid bone;

   INTERNAL PART—quadrilateral, articulating with the Semilunar bone:

2. **External**—prolonged downwards, in form of—

   The Styloid Process—which (attaches a ligament by its apex, and) is marked by—

   External Lateral L.

   TWO GROOVES—running downwards and forwards along its Outer Aspect (and transmitting two tendons;—
   THE ANTERIOR—one, and
   THE POSTERIOR—another);

   Extensor ossis metacarpi pollicis M.
   Extensor primi internodii pollicis M.

3. **Internal**—wider than the External and presenting the—

   Sigmoid Cavity of the Radius—a narrow, concave, smooth surface, for articulation with the articular Surface on the Outer aspect of the Head of the Ulna;

4. **Anterior**—continuous with the Anterior surface or the Shaft, and concave and rough (for attaching a ligament of the Wrist);

   Anterior L. of Wrist.

5. **Posterior**—convex and continuous with the corresponding Surface of the Shaft, and presenting—

   Grooves—three, of which the—

   1. CENTRAL ONE—is narrow and deep, and more marked than the others (and transmits a tendon);

      Extensor secundi internodii pollicis T.

   2. INNER—is broad and shallow (for transmitting five tendons—four of one muscle and one of a second);

      Extensor communis digitorum and Indicator T.

   3. OUTER—is also broad and shallow, and often sub-divided into two (for transmitting two tendons of two other muscles).

      Extensor carpi radialis longior & brevior T.

III. The Shaft or Body—which is prismatic, the

prism being triangular and gradually increasing downwards. It is slightly curved, so as to be convex outwards, and presents three Surfaces separated by three Borders :—

Borders—three—

1. **Internal**—concave and opposed to the External Border of the Ulna, (with which it is connected by a broad ligament that stretches between the two, and is *Interosseous L.* | fixed nearly to their whole length) It commences above at the back part of the Bicipital Tuberosity and ends below by two branches to meet the two ends of the Sigmoid Cavity of the Lower Extremity ;

2. **Anterior**—curved, commencing above at the front part of the Bicipital Tuberosity, and ending below at the front of the root of the Styloid Process. It is prominent above and below, and is divided into—

    1. **The Oblique Line**—which is the oblique upper *Supinator brevis& Flexor sublimis digitorum M.* | portion (for attaching two muscles);

    2. **The Middle Portion**—indistinct ;

    3. **The Lower Portion**—prominent (for attaching *Pronator quadratus M.* | another muscle);

    4. **The Tubercle** of the Radius –at the root of the *Supinator longus M.* | Styloid Process (for attaching a fourth muscle):

3. **Posterior**—commencing above at the back part of the Neck, and ending below at the back part of the root of the Styloid Process. It is distinct only at the middle.

Surfaces—three—

1. **Anterior**—looking somewhat inwards, and getting wider below, presenting from above downwards—

    1. **A Rough concave Portion**—above and narrow *Flexor longus pollicis M.* | (for attaching a muscle) ;

    2. **Medullary Opening**—above the middle, going obliquely upwards ;

    3. **A Smooth flat Portion**—below and wide (for *Pronator quadratus M.* | attaching another muscle) :

Contd.—**2. Posterior**—looking somewhat inwards and also presenting three portions;—

(1.) **A smooth Rounded portion**—above and narrow (and covered by a muscle);

Supinator brevis M.

(2) **A Concave rough portion**—in the middle (for attaching two muscles);

Extensor ossis metacarpi pollicis & Extensor primi internodii pollicis M.

(3.) **A Flat curved portion**—below, (which is traversed by the tendons of the five muscles, which afterwards pass through the Grooves on the back part of the Lower Extremity):

Extensor carpi radialis longior, Extensor carpi radialis brevior, Extensor secundi internodii pollicis Extensor indicis, & Extensor communis digitorum M.

3. External—narrowest of the three surfaces, and likewise presenting three portions;—

(1.) **A rounded Portion**—above, (attaching one muscle);

Supinator brevis M.

(2.) **A rough Impression**—in the middle, (for inserting a muscle);

Pronator radii teres M.

(3) **A narrow smooth Portion**—below, (which is covered by the two tendons, that afterwards course along the Outer surface of the Styloid Process).

Extensor ossis metacarpi pollicis & Extensor primi internodii pollicis M

Articulation—with the HUMERUS above, with the SCAPHOID and SEMILUNAR bones (of the Carpus) below, and with the ULNA on the inner side.

[**Structure**—similar to other Long bones.

[**Development**.—One piece **at birth** as the Shaft, appearing before the ossification of the Vertebræ. The Extremities, which are cartilaginous then, are ossified **after birth**:—

1. THE LOWER EXTREMITY—from one point, appearing in the 2nd year and joining the Shaft by the 20th;
2. THE UPPER EXTREMITY—from also one point, appearing in the 5th year and joining the Shaft by the 18th.

◆

4. THE HAND—

Which is the smallest and the most complicated portion of the Upper Extremity, is ovoid in form, convex behind and concave in front, and contains 32 joints, being made up of 27 bones, which are arranged in three well-marked Tracts or divisions, that are called respectively —(1) the **Carpus** or Wrist, (2) the **Metacarpus** or Palm, and (3) the **Phalanges** or Fingers.

1. THE CARPUS-

Or the Wrist, consisting of EIGHT SMALL BONES, arranged in two Rows :—

First Row having—
from without inwards—

1. **The Scaphoid,**
2. **The Semilunar,**
3. **The Cuneiform,**
4. **The Pisiform ;**

Second Row having—
from without inwards—

1. **The Trapezium,**
2. **The Trapezoid,**
3. **The Os Magnum,**
4. **The Unciform.**

All these, excepting the Pisiform, are cuboid bones, and therefore have SIX SURFACES. Of these. the Anterior and Posterior are always rough (for attaching ligaments), the Posterior being generally the larger of the two; and the Superior and Inferior are always articular, the Superior being convex and the Inferior concave. Of the Lateral surfaces, the *extreme* ones are rough (for attaching ligaments), while the *adjoining* surfaces are more or less articular. These last are plane in the First Row, but sinuous in the Second.

[**The Structure** of all is a highly elastic cancellous substance, enveloped in a very thin layer of compact tissue.

[**Development** of each is from A SINGLE POINT, appearing from the 1st to the 15th year **after birth** ; the Os magnum and the Cuneiform being the first, while the Pisiform is the last. Indeed this is the last of the whole skeleton to ossify.

A. *THE FIRST ROW.*

I. THE SCAPHOID—which is the largest of this Row and oblong, being placed obliquely, with the long diameter running from above downwards, outwards and forwards; and which has the—

1. **Upper Surface**—looking outwards and backwards, being convex and triangular in form, for articulation with the outer division of the Lower Surface of the Radius ;
2. **Lower Surface**—looking also outwards and backwards, and being likewise convex and triangular, but divided by an antero-posterior Ridge into two parts ;—
   (1.) The Outer Part—triangular and large, for articulation with the Trapezium ;
   (2.) The Inner Part—small and quadrilateral, for articulation with the Trapezoid :

3. **Back Surface**—very narrow and in fact converted into a mere Groove by the encroachment of the Upper and Lower Surfaces;

4. **Front Surface**—looking upwards and inwards, being concave and rough above, and presenting a—TUBERCLE below, which is prominent (for attaching a ligament and a muscle);

Anterior Annular L.
Abductor pollicis M.

5. **Outer Surface**—looking slightly upwards, being narrow and rough (for attaching a ligament);

External Lateral L

6. **Inner Surface**—looking slightly forwards, being smooth and cartilaginous, and divided by a crescentic Ridge into two parts;—

   (1.) THE UPPER PART—narrow, flat and semilunar, for articulation with the Semilunar bone;

   (2.) THE LOWER PART—large and concave, contributing to form the Socket for the Os Magnum.

Articulation—with the RADIUS above, and the TRAPEZIUM and TRAPEZOID bones below, and also with the SEMILUNAR and OS MAGNUM internally.

II. THE SEMILUNAR—a crescentic bone, with the concavity below. It is antero posteriorly long, the front end being more extensive than the back; and it presents the—

1. **Upper Surface**—convex and quadrilateral, for articulation with the inner division of the Lower Surface of the Radius;

2. **Lower Surface**—concave antero posteriorly and plane laterally, and divided along its length into two parts;—

   (1.) THE OUTER PART—large, forming with the Scaphoid, the Socket for the Os Magnum;

   (2.) THE INNER PART—very narrow, for articulation with the summit of the Unciform bone:

3. **Outer Surface**—looking somewhat backwards, being narrow, semilunar and plane, for articulation with the Inner Surface of the Scaphoid;

4. **Inner Surface**—looking slightly forwards and downwards, being flat and quadrilateral, for articulation with the Cuneiform bone;

5. **Anterior Surface**—large;

6. **Posterior Surface**—small, being encroached by the Upper Surface.

Articulation—with the RADIUS above, and the OS MAGNUM and UNCIFORM bones below, and also with the SCAPHOID and CUNEIFORM bones on the sides.

III. THE CUNEIFORM—pyramidal and obliquely placed, with the apex looking *downwards* and INWARDS, and having the—

1. **Upper Surface**—looking very much inwards and presenting two parts—

   (1.) INNER PART—non-articular, small and rough;

   (2.) OUTER PART—articular, large and smooth, convex and quadrilateral, for articulation with the Head of the
   Triangular F. C. | Ulna (by the intervention of an inter-articular fibro-cartilage):

2. **Lower Surface**—looking very much outwards and quadrilateral in form, being smooth and sinuous, for articulation with the Unciform bone;

3. **Outer Surface**—forming the base of the pyramid that represents the bone, and looking outwards, upwards and backwards. It is smooth and quadrilateral, for articulation with the Semilunar bone;

4. **Inner Surface**—very small (forming the apex of the pyra-
Internal Lateral L. | mid and the lowest part of the bone), and rough (for attaching a ligament of the Wrist);

5. **Front Surface**—rough externally and presenting an Articular Surface internally, which is oval and convex for articulation with the Pisiform bone;

6. **Back Surface**—rough.

Articulation—with the ULNA above (by the intervention of a fibro-cartilage) and the UNCIFORM (bone of the 2nd Row of Carpus) below; and with the SEMILUNAR bone externally, and the PISIFORM in front.

IV. THE PISIFORM—quite an exceptional bone, being the smallest of all and of an ovoid form, and having the—

1. **Back Part**—presenting an ARTICULAR SURFACE, which is the *only one* in the bone, and is concave for articulation with the Front Surface of the Cuneiform bone;

2. **Front Part**—rough (for attaching a ligament);
Anterior annular L. |

3. **Outer Aspect**—also rough, (attaching part of another
Internal Lateral L. | ligament);

4. **Upper Part**—likewise rough (for attaching a muscle);
Flexor carpi ulnaris M. |

5. **Lower Part**—also rough (attaching another muscle).
Abductor minimi digiti M. |

Articulation—with only the CUNEIFORM bone.

B. THE SECOND ROW.

I. THE TRAPEZIUM—irregularly cuboid, with its—

1. **Upper Surface**—concave, looking somewhat inwards and articulating with the outer division of the Lower Surface of the Scaphoid;

2. **Lower Surface**—looking a good deal outwards, being concave laterally and convex antero-posteriorly and articulating with the First Metacarpal bone;

3. **Inner Surface**—divided into two parts;—

   (1.) The Upper Part—which is large and concave, and looks slightly backwards, for articulation with the Trapezoid bone;

   (2.) The Lower Part—which is small and flat, and looks more downwards, for articulation with the lateral aspect of the Second Metacarpal bone:

4. **Outer Surface**—rough, (for attaching a ligament of the
External Lateral L. | Wrist);

5. **Posterior Surface**—rough;

6. **Anterior Surface**—presenting—

   (1.) An Oblique Ridge—along the middle, passing down-
Anterior Annular L. | wards and inwards (and attaching a ligament
Opponens, Flexor brevis
& Adductor pollicis M. | with three muscles);

   (2.) A Groove—along the inner side of the oblique Ridge
Flexor Carpi radialis T. | (for transmitting a tendon):

Articulation—with the Scaphoid above, and the Trapezoid and Second Metacarpal bones internally; and with the First Metacarpal bone below.

II. THE TRAPEZOID—the smallest bone of this Row and roughly quadrilateral, being larger below and behind than above and in front, and having the—

1. **Upper Surface**—small and quadrilateral, and concave for articulation with the inner portion of the Lower Surface of the Scaphoid;

2. **Lower Surface**—convex laterally and concave antero-posteriorly for articulation with the Second Metacarpal bone, and presenting at times an additional small Facet at its inner and back part for articulation with the Third Metacarpal bone;

3. **Outer Surface**—smooth and convex, for articulation with the Trapezium;

4. **Inner Surface**—presenting—

(1.) An Articular Portion—in front, which is concave, for articulation with the Os Magnum;

(2.) A Rough Portion—behind (for attaching ligaments):

5. **Anterior Surface**—rough (and attaching a muscle);
Abductor pollicis M |

6. **Posterior Surface**—largest of all Surfaces and rough.

Articulation—with the Scaphoid above and the Trapezium externally, with the Os Magnum internally and the Second (and sometimes the Third) Metacarpal bone below.

III. THE OS MAGNUM—the largest of all the Carpal bones, and placed at the middle of the group. It is divided into two portions;—the Upper Portion being rounded and smooth and called the Head, while the Lower Portion is cubical and square and called the Body. The intermediate constriction is called the Neck. Like the other Carpal bones, it presents six Surfaces:—

1. **Upper Surface**—convex and smooth, forming the top of the Head and articulating with the Semilunar bone;

2. **Lower Surface**—smooth and divided, by two antero-posterior Ridges, into three parts, of which the—

(1.) Middle Portion—is the largest and sinuous, for articulation with the Third or middle Metacarpal bone;

(2.) Outer Portion—is next in size and concave, for articulation with the Second Metacarpal bone;

(3.) Inner Portion—is the smallest and placed at the back part, for articulation with the Fourth Metacarpal bone:

3. **Inner Surface**—presenting—

(1.) A Rough Portion—in front (for attaching a ligament);
Interosseous L. |

(2.) An Articular Portion—behind, which is smooth and concave, and vertically long, for articulation with the Unciform bone:

4. **Outer Surface**—presenting—

(1.) A Rough Groove—across the middle, representing the
Interosseous L. | Neck of the bone (and attaching ligaments);

(2.) The Upper Division of Surface—smooth and convex, forming the side of the Head, for articulation with the concave surface of the Scaphoid;

(3.) The Lower Division of Surface—presenting—

1. An Articular Portion—in front, which is flat, for articulation with the Trapezoid bone;

2. A Rough Portion—behind (which attaches liga-
Interosseous L. | ments):

5. **Anterior Surface**—rough and convex;

6. **Posterior Surface**—larger than the Anterior, but like it rough and convex.

Articulations—with the SEMILUNAR bone above, and the SECOND, THIRD and FOURTH METACARPAL bones below; with the SCAPHOID and TRAPEZOID externally, and the UNCIFORM internally.

IV. THE UNCIFORM—large and wedge-shaped, and placed between the Os Magnum and Cuneiform bones. It is characterized by a large Hook-like Process at its front part, and is obliquely placed with the base of the wedge downwards; and presents the—

1. **Upper Surface**—extremely narrow, forming the apex of the wedge, and articulating with the inner division of the Lower Surface of the Semilunar bone;

2. **Lower Surface**—concave from before backwards, and divided by an antero-posterior Ridge into two parts;—

   (1.) OUTER PORTION—small and looking downwards, and plane from side to side, for articulation with the Fourth Metacarpal bone;

   (2.) INNER PORTION—large and looking somewhat inwards, and convex from side to side, for articulation with the Fifth Metacarpal bone:

3. **Outer Surface**—presenting—

   (1.) AN ARTICULAR SURFACE—posteriorly, which is convex for articulation with the Os Magnum;

   (2.) A ROUGH SURFACE—anteriorly (for attaching a ligament):

Interosseous L.

4. **Inner Surface**—looking very much upwards, being convex behind and above and concave in front and below, and articulating with the Cuneiform bone;

5. **Back Surface**—triangular, convex and rough;

6. **Front Surface**—also rough but peculiar, presenting the—

UNCIFORM PROCESS—a curved plate of bone (attaching a ligament by its summit and two muscles by its lower border and) having—

Anterior Annular L. Adductor and Flexor brevis, minimi digiti M.

SURFACES—two, which are lateral, of which the Outer is concave, forming a Groove (for the transmission of several tendons).

Flexor sublimis and profundus digitorum and Flexor longus pollicis T.

Articulations—with the CUNEIFORM and SEMILUNAR bones internally and above, with the OS MAGNUM externally, and with the FOURTH and FIFTH METACARPAL bones below.

THE CARPUS IN GENERAL.

Thus formed of the eight bones, the Carpus is elliptical in form and transversely long, being convex behind and concave in front. This front concavity is increased and converted into a Groove by four lateral prominences—the Scaphoid Tuberosity and Trapezium Ridge on the outer side, and the Pisiform bone and Unciform process internally—through which the flexor tendons of the Hand are transmitted. The upper border is convex and even, to articulate mainly with the lower end of the Radius which is the outer of the two bones of Forearm, and also by the intervention of a fibro-cartilage with that of the Ulna situated somewhat internally. The lower border is also convex, but interrupted or notched as it were, for articulation with the several Metacarpal bones. Respecting its—

Mechanism—the Carpus may be considered as **divided into two Groups**—an **Outer** containing the Scaphoid, Trapezium and Trapezoid bones; and an **Inner** comprising the remaining ones. The Inner group is characterized by firmness and the Outer by its greater elasticity.

The Radio-Carpal articulation—is a sort of flattened enarthrosis,—the Carpal Surface being convex in every way, and the Radial Surface concave; the transverse extent of this joint increasing its stability; and, at the same time, allowing it both antero-posterior (Flexion and Extension) and lateral (Adduction and Abduction) motions. The articular Surfaces being not round, rotation is prevented, and Circumduction takes place; which last is only a combination of the four movements above mentioned. Again the Carpal Surface being more extensive behind than before, it allows a freer extension than flexion. This however is more than compensated by the flexing movements of the Carpus itself.

The Carpo-Ulnar articulation—is much smaller, with the articular ends of the bones widely apart. This interval is only partially filled up by an inter-articular fibro-cartilage,—and thus allows the Hand to be more adducted than abducted.

The Rotation of the Hand—is effected by a circular motion of the Radius, with which it is principally connected. The Radius is so curved and situated that, while its Head rotates upon its own axis within the Lesser Sigmoid Cavity of the Ulna, its Lower End describes an arc round the Head of that bone. It is this arc that is represented by the Sigmoid Cavity of the Radius.

The Elbow Joint—is only a hinge-joint, formed mainly by the corresponding Trochlear surfaces of the Humerus and Ulna, with which the Head of the Radius has but little to do.

2. THE METACARPUS OR PALM-

Consists of a series of FIVE cylindrical bones. that are named from without inwards—the First, Second, Third, Fourth and Fifth

METACARPAL BONES. These are articulated with the Carpal bones above, where they are approximated to each other; but they diverge below, where they support the Fingers The First is rather an exceptional one. Like the Long bones, they have all two Extremities and a Shaft:—

I. The Upper Extremity or **Carpal End**—is expanded and cubical, being wider behind, and having—

Surfaces—five—

Superior—smooth and cartilaginous, for articulation with some of the Carpal bones;

Carpo-Metacarpal L. | Anterior & Posterior } rough and tubercular, (for attaching ligaments);

Internal & External } presenting small ARTICULAR FACETS—for articulation with each other:

II. The Lower Extremity or **Digital End**—presents an oblong articular Condyle, which is flattened laterally and prolonged forwards, and has—

Surfaces—likewise five—

Inferior—convex and smooth, for articulation with the Phalanges, and extending upwards in front, where it is somewhat wider;

Lateral—presenting each a ROUGH DEPRESSION, bounded by
Lateral L. | a TUBERCLE at its back part (for attaching a ligament);

Posterior—flat and wide;

Anterior—concave, presenting a GROOVE at the middle (transmitting tendons), and bounded by Tubercles or diminutive CONDYLES on each side:

III. The Shaft or **Body**—is prismatic and curved, so as to be convex behind and concave in front; and presents three Surfaces separated by three Lines:—

1. Lines or **Borders**—three—

Anterior—bifurcated both above and below, but single and prominent at the middle, where it presents the MEDULLARY FORAMEN;

Lateral—extending from the Lateral aspects of the Carpal End to the Lateral Tubercles of the Lower Extremity:

2. Surfaces—three—

Posterior—convex and wide above and below, presenting—

(1.) A Longitudinal Ridge—at the upper part, which bifurcates at the middle of the bone, the two branches passing thence downwards, to meet the Lateral Tubercles of the Lower Extremity ;

(2.) Two Upper Triangular Portions of the Surface—looking more laterally, with the apex downwards (and giving attachment to muscles); *Dorsal Interossei M.*

(3.) One Lower Triangular Portion of the surface —(which is covered by tendons): *Extensor T.*

Lateral—separated from each other by the Anterior Line, and slightly concave (giving attachment to muscles). *Interossei M.*

Structure—same as other Long bones.

Development—by two points, one for the Shaft and one for the Lower Extremity. The first bone is not included in these; as the second point in that is for the Upper Extremity.

Articulations—with the Carpal bones and with each other above, and with the Phalanges below.

OF THE DIFFERENT METACARPAL BONES—

The First—is altogether an exceptional one ; and is the shortest and widest of all. It is placed more in advance of the others, with the Anterior Surface looking a good deal inwards, and the Lower End diverging much more than the others of the series ; and it has the—

I. Upper Extremity—more extensive laterally, having the—

Carpal Surface—peculiarly formed, concave antero-posteriorly and convex laterally, to articulate with the Lower Surface of the Trapezium ;

Lateral Surfaces—wanting in the articular facets. The Outer—has a rough Tubercle (for the attachment of a muscle). *Extensor ossis metacarpi pollicis M.*

Anterior Surface—prolonged into a long thin lip to embrace the Trapezium ;

Posterior Surface—prolonged into a thicker and stronge lip, which is shorter than the anterior one :

II. Lower Extremity—likewise extensive laterally, the Articular surface being convex and prolonged upwards in front, forming there two small articular Condyles, that correspond with two Sesamoid bones :

III. Shaft—very wide, having the—

Anterior Border—less marked
Flexor brevis pollicis M. | (attaching a muscle) ;

Inner Border—distinct
Abductor Indicis M. | (attaching another muscle) ;

Outer Border—also distinct
Opponens pollicis M. | (attaching a third muscle) ;

Posterior Surface—devoid of the bifurcated Ridge, that exists in all the other metacarpal bones.

Development—by two points, one for the Shaft and one for the Upper Extremity, instead of the Lower, as is the case with the others.

N. B.—The First is the shortest of all Metacarpal bones. The next longer is the Fifth, and then the Fourth, and the Second : the Third or middle one is the longest of the series. These bones differ in only their Upper Extremity and are alike in other respects :—

The Second—is the second in length, having the—

Carpal Extremity—prolonged upwards internally (for
Flexor carpi radialis & Extensor carpi Radialis longior M. | attaching muscles—one in front and one behind), and having the—

1. **Upper Surface**—divided into three parts, of which the—
   (1.) Outer Part—is flat and quadrilateral, for articulation with the Trapezium ;
   (2.) Middle Part—is the largest, being concave laterally and convex from before backwards, and articulates with the Trapezoid bone ;
   (3.) Inner Part—is very narrow and articulates with the Os Magnum :
2. **Inner Surface**—presenting—
   Two Flat Facets—one in front of the other, for articulation with similar facets on the Third metacarpal bone.

The Third—is the longest of the series, having the—

Upper Extremity—presenting—

1. **A Pyramidal Eminence**—at the outer and back part, which goes behind the Os Magnum in the articulated Hand ;
2. **Upper Surface**—concave behind and convex in front, for articulation with the middle division of the Lower surface of the Os Magnum :
3. **Lateral Surfaces**—each having a pair of articular facets, to articulate with the adjoining bones ;
4. **Posterior Surface**—marked with a Tubercle (for at-
Extensor carpi radialis brevior M. | taching a muscle).

The Fourth—is the next larger to the Second, having the—

Upper Extremity—presenting the—

1. **Upper Surface**—divided into two parts—

   (1.) THE INNER PART—large, and plane laterally but convex antero-posteriorly, for articulation with the Outer division of the Lower surface of the Unciform bone;

   (2.) THE OUTER PART—very small and flat and situated posteriorly, to articulate with the Inner division of the Lower surface of the Os Magnum :

2. **Outer Surface**—showing—

   TWO OVAL FACETS—separated by a Groove—and articulating with corresponding facets on the Third metacarpal bone;

3. **Inner Surface**—showing—

   ONLY ONE FACET—which is concave, for articulation with the Fifth metacarpal bone.

The Fifth—is the smallest of the inner four bones, and has the—

1. **Upper Extremity**—presenting the—

   1. **Upper Surface**—convex from before backwards and concave laterally, for articulation with the Inner portion of the Lower surface of the Unciform bone;

   2. **Outer Surface**—narrow, having only ONE ARTICULAR SURFACE, which is convex, for articulation with the side of the Fourth metacarpal bone;

   3. **Inner Surface**—showing a TUBERCLE—which is rough (for attaching a muscle);

Extensor carpi ulnaris M.

2. **Body**—peculiar for its—

   Posterior Surface—which presents—

   1. A DIAGONAL LINE (instead of the Longitudinal divided line)—passing from the inner side of the Upper Extremity to the outer side of the Lower, and dividing the Posterior surface into two parts instead of three, as is the case with the others;

   2. AN OUTER PORTION of the Surface—which is concave (for attaching a muscle);

Fourth Dorsal Interosseous M.

   3. AN INNER PORTION of the surface—situated below and more extensive, (and covered by tendons).

Extensor T.

The Metacarpus or Palm as a whole—

Is a region of quadrilateral form, which is wider below than above and convex behind and concave in front. The Carpo-Metacarpal joints are formed of slightly curved surfaces, and are therefore susceptible of very slight movements. The First and the last are exceptions to this; the former being a reciprocal enarthrodial joint, and allowing the Thumb a degree of mobility and power of opposition, which are impossible in the others. The Fifth is similar to this, but the movements are very limited. The Second joint is also peculiar in another way; in so far that this metacarpal bone is received into a RECESS formed by the Trapezium, Trapezoid and the Os magnum. The Inter-Metacarpal joints are simple gliding joints.

THE FINGERS-

Are altogether five; each consisting of three **Phalanges**, which are known as the METACARPAL, the MIDDLE and the TERMINAL. The Thumb is wanting in its middle phalanx; so that,

THE PHALANGES—

Are altogether fourteen (3 times 4 and 2 for the Thumb); they are all of the sort of cylindrical bones; each having—

1. **Two Extremities**—which are more extensive laterally, convex behind and concave in front, and rough on the sides;—

   The Upper—being larger, cubical in form, and presenting—

   THE TERMINAL SURFACE—concave;

   The Lower—being tubercular in the Terminal Row and articular in the two others:

2. **The Body** or **Shaft**—which tapers below and is slightly curved, being concave forwards and presenting—

   Surfaces—only two, which are both smooth (for the gliding of tendons;—

Extensor T. | POSTERIOR—which is convex, supporting one;

Flexor T. | ANTERIOR—which is concave, supporting another);

Borders—also two, which approximate below (and give attach-
Vaginal L. | ment to ligaments).

Differential Characters of the Phalanges.

The First Row—have the longest and largest bones; with the—

1. **Upper Extremity**—tubercular on the sides (for attach-
Interossini M. | ing muscles) and presenting—

   A GLENOID CAVITY—which is transversely long;

2. **Lower Extremity**—presenting;

   (1.) A TROCHLEAR SURFACE—below, which is prolonged upwards in front;

   (2.) ROUGH DEPRESSIONS—on the sides (for attaching
Lateral L. | ligaments);

3. **Shaft**—looking very like a split bamboo.

Contd.—**The Second Row**—has the bones intermediate in size, with the—

Upper Extremity—rough at the back part, (for attaching the middle slip of a divided tendon) and having the—

Extensor communis digitorum

Upper Surface—showing—

Two Lateral Depressions;

Shaft—(attaching by its two Borders the two divisions of *Flexor sublimis digitorum.* | one bifurcated tendon).

The Third Row—has the shortest bones; with the—

Shaft—very tapering;

Lower Extremity—tubercular and crescentic;

Upper Extremity—presenting a double trochlear articular surface as in the Second row, with the circumference very tubercular (for attaching tendons).

Extensor communis & Flexor profundus T.

N. B.—The different bones of each row are only distinguished by their relative size; thus—of all, the longest are those for the Middle finger the next in size are for the Ring finger, then those for the Index finger, Little finger and Thumb in succession.

[**Structure**—as usual with the long bones.

[**Development**—of each from two points;—one for the Shaft and Lower Extremity, appearing within the 2nd month of gestation, and the other for the Upper Extremity, appearing within five years after birth. The two pieces join about the 20th year. Ossification is earlier in the first row and latest in the second.

Mechanism—The Metacarpo-Phalangeal joints are enarthroses;—flexion being most extensive, then adduction and abduction, and lastly extension. The Inter-phalangeal joints are hinge-joints, with a central Ridge on the lower surface, received into a Groove on the upper:—this obviates the chance for any dislocations.

II. THE LOWER EXTREMITIES—

Are the exact analogues of the Upper Extremities; and like them, consist of four subdivisions :—

1. **THE HAUNCH**—which corresponds to the Shoulder, and has already been described in chapter II;
2. **THE THIGH**—corresponding to the Upper Arm, and formed by one single bone—the **Femur**;
3. **THE LEG**—corresponding to the Forearm, and composed of two bones—the **Tibia** and **Fibula**;
4. **THE FOOT**—corresponding to the Hand, and like it composed of 27 bones united by 32 joints, and divided into three divisions :—
    1. **The Tarsus**—corresponding to the Carpus, and composed of 7 bones;
    2. **The Metatarsus**—corresponding to the Metacarpus, and composed of 5 bones.
    3. **The Toes**—corresponding to the Fingers, and composed of 14 bones.

THE FEMUR OR THIGH BONE-

Is the biggest bone of the whole body, and is longitudinally convex in front. It is nearer to the opposite bone at the lower part than above, where it is bent inwards to articulate with the Cotyloid Cavity of the Innominate. Like other long bones, it has two Extremities and a Shaft: —

I. The Upper Extremity—presenting a Head, a Neck, two Trochanters, one Tubercle, an Inter-trochanteric Line and a Spiral Line :—

I. The Head—which is globular and more than half a sphere, and which looks upwards, inwards and a little forwards, to articulate with the Acetabulum. It is smooth throughout, excepting a spot just behind and below its centre, *Round L. of Hip.* | which is rough (for attaching a ligament).

II. The Neck—which is strong and pyramidal, and directed upwards, inwards and forwards, and forms an obtuse angle (of 125°) with the Shaft of the bone. It is flattened from before backwards, so as to be thickest along the vertical line,—in which it has to bear the weight of the body; and it is enclosed within the capsular ligament of the joint, which is attached around its base. It is marked out from the Head by a sinuous border, and from the Shaft—by the two Trochanters, the Intertrochanteric Line, the Tubercle and the Spiral Line; and it presents—

Contd — **Borders**—two—

Superior—wide and short, and limited externally by the Great Trochanter ;

Inferior—longer and narrower, and turning a little backward below, to terminate at the Small Trochanter :

Surfaces—two—

Anterior—rough and bounded below by the Tubercle and the Oblique Line ;

Posterior—large, smooth and concave, and bounded below by the Inter-trochanteric Line.

III. The Trochanter Major—which is placed at the outer end of the Neck, at the summit of the Shaft, and is large, flat and quadrilateral ; presenting two Surfaces and four Borders :—

Surfaces—two—

External—convex, quadrilateral and continuous with the outer Surface of the Shaft, and presenting—

1. A Diagonal Line—passing obliquely from the Posterior-Superior Angle downwards and for-
Gluteus medius M. | wards (and attaching a tendon) ;

2. Triangular Surfaces—above and below the diagonal Line, which are smooth (for the gliding
Gluteus medius & maximus T. | of tendons) ;

Internal—attached to the rest of the bone at the front and lower part, but free at the upper and back parts, where it forms—

Gamellus superior, | The Digital Fossa—otherwise called—
Obturator internus, | The Trochanteric Fossa—which is rough
Gamellus inferior & |
Obturator externus M | (for attaching four muscles) :

Borders—four—

Superior—thick and free, horizontal and marked with
Pyriformis &
Gluteus minimus T. | impressions (of two tendons) ;

Inferior—continuous with the outer Surface of the Shaft, and represented by only a rough Line (which
Vastus externus M. | attaches a portion of a big muscle) ;

Posterior—vertical and rounded, free and forming the posterior Lip of the Trochanteric Fossa ;

Anterior—irregular and prominent only at the upper part :

Angles—four, of which one only is important—

The Superior-Posterior—which is free and prominent, and bent inwards, arching over the Digital
Pyriformis T. | Fossa (and attaching a tendon).

IV. The Trochanter Minor—a pyramidal process, springing from where the Lower Border of the Neck joins the Shaft, and going inwards and backwards, and presenting—

1. The Summit—which is rough (for giving insertion
United T. of Psoas & Iliacus M. | to a tendon):

2. Borders—three—

Superior—continuous with the lower Border of the Neck;

Posterior—continuous with the Inter-trochanteric line;

Inferior—continuous with the Inner Branch of the Linea Aspera on the Shaft:

3. Surfaces—three—Superior, Anterior and Posterior;
Quadratus femoris M. | —of which the last is smooth (for the gliding of a muscle).

V. The Tubercle of the Femur—which may be called the Upper Tubercle, and is situated in front of the bone, at the base of the Neck and anterior to the Trochanter Major, from which it is separated by—

A Triangular Surface—which may be taken as the Anterior Surface of the Trochanter major, and is concave (for lodging a bursa for the free gliding of a tendon).
Gluteus medius M. | The Tubercle is the meeting point of—

Three rough Lines—of which the—

First—goes to the Superior Border of the Tro-
Gluteus minimus M. | chanter major (and attaches a muscle);

Second—goes to the Inferior Border of the Trochanter major, (and limits the attachment of
Vastus externus M. | a muscle);

Third—goes downwards and inwards, forming the upper part of the Spiral line, (and limiting the
Crureus M. | attachment of a third muscle).

VI The Inter-Trochanteric Line—which runs along the base of the Neck at the back, extending from the Trochanter minor to the Posterior-inferior Angle of the Tro-
Capsular L. of Hip. | chanter major, (and attaching part of a ligament).

VII. The Spiral or Oblique Line—which also
Capsular L. | runs along the base of the Neck but in front, commencing
Crureus M. | at the Tubercle of Femur and going downwards and inwards, spirally round the bone, to meet the upper part of the Linea Aspera at the back of the Shaft. It is rough above the level of the Trochanter Minor (and attaches part of a ligament, forming the upper limit of
Vastus internus M. | the origin of a muscle), but less prominent below (where it limits the attachment of another muscle).

II. The Lower Extremity

larger and cuboid in shape, being most extensive laterally and behind, and presenting two Condyles separated by an Inter-Condyloid notch :—

1. The Condyles—two—oblong eminences, which are long antero-posteriorly and flat laterally. They project more behind, and are not exactly parallel to each other ;—the EXTERNAL—which is the larger and thicker of the two, lying quite antero-posteriorly, and projecting more forwards than the INTERNAL—which is smaller but more prominent both below and inwardly, and which runs obliquely backwards and inwards. These Condyles have—

Surfaces—six for each ;—

1. **Inferior**—convex and smooth, for articulation with the Upper Extremity of the Tibia ; and separate for the two Condyles, being separated by the Inter-Condyloid Notch ;

2. **Posterior**—continuous with the Inferior surfaces, and like them smooth, convex and separate ;

3. **Anterior**—also smooth and articular, but joined together, forming—

   A Trochlear Surface—for articulation with the Patella, having—

   A VERTICAL GROOVE—in the middle, gradually deepening below and separating—

   TWO LATERAL CONVEXITIES—of which the EXTERNAL is more wide and prominent and prolonged further upwards :

4. **Superior**—fixed to the Shaft anteriorly but rough and free posteriorly ;

5. **Lateral**—altogether four : of these the—

Adjoining two—are opposed to each other, forming the boundaries of the Inter-Condyloid Notch, and are small, rough and concave (for attaching ligaments) ;

Outer—Anterior crucial &
Inner—Posterior crucial L.

Extreme two—are more extensive and rough (attaching ligaments), and forming the—

Lateral L of Knee.

Tuberosities of Femur—of which the—

Contd.—

Internal—is large and surmounted by—

1. THE LOWER TUBERCLE of Femur—situated quite at the summit of the Tuberosity (and forming the lower limit of attachment of a muscle); — *Adductor magnus M.* |
2. A ROUGH DEPRESSION—behind the Tubercle (for attaching a tendon): — *Inner head of Gastrocnemius M.* |

External—is small and angular, presenting—

1. A ROUGH DEPRESSION—about the middle (for attaching a tendon); — *Outer head of Gastrocnemius M.* |
2. A GROOVE—below it, passing backwards, towards the posterior extremity, and smooth (for the gliding of a tendon); — *T. of Popliteus M.* |
3. A ROUGH IMPRESSION—forming the anterior limit of this Groove (and fixing the above tendon): — *T. of Popliteus M.* |

2. The Inter-condyloid Notch—which is the space, bounded laterally by the contiguous surfaces of the Condyles, and anteriorly by the end of the Shaft. It is open above, behind and below (and lodges two ligaments). — *Crucial L.* |

III. The Shaft—quite cylindrical, only a little flattened at the upper and lower parts:—flattened from before backwards and inwards above, but directly backwards below. It is curved, being convex forwards; and has the Borders very indistinct, with the exception of the Posterior one; and, like all other long bones, presents—

I. Lines or **Borders**—three, of which one only is distinct and prominent, the others being only traced between certain prominent points at the Extremities:—

1. The Posterior or the **Linea Aspera**—which is the most prominent and is single at the middle and forked at the upper and lower portions; thus:—

1. **The Middle Portion**—which is Crest-like, having two Lips with a narrow Interval between, and presenting—
   1. THE MEDULLARY OPENING—going upwards;
   2. THE INNER LIP—(attaching three muscles—
      one—internally, and— — *Vastus internus M.* |
      two—externally); — *Adductors brevis & longus M.* |

Contd — 3. The Outer Lip—(attaching two muscles—

Short head of Biceps & Vastus Externus M.

one—internally, and—
one—externally).

Adductor magnus M.

4. The Interval—very narrow (and attaching only one muscle):

2. **The Upper Part** or **Bifurcation**—having two Branches and a larger Interval:—

Adductor magnus Vastus externus & Gluteus maximus M.

1. The Outer Branch—rough and going almost vertically upwards to the Trochanter major, (and attaching three muscles—one internally, one externally, and one intermediately);

Vastus Internus & Pectineus M.

2. The Inner Branch—shorter and less distinct, and going up to the Trochanter minor (and attaching two muscles—one internally, and one externally):

Quadratus femoris & Adductor magnus M.

3. The Upper Interval—which is triangular and smooth (and covered with two muscles,) presenting the—

Quadratus femoris M.

Linea Quadrata—running vertically downwards from the Posterior-inferior angle of the Trochanter major, for about two inches, (and giving insertion to a muscle):

3. **The Lower Part** or **Bifurcation**—having the Branches longer and more widely apart and the Interval much larger :—

Vastus externus M.

1. The Outer Branch—more prominent, running down to the summit of the External Tuberosity (and attaching one muscle externally);

Vastus internus & Adductor magnus M.

Hunter's canal for the Popliteal A.

2. The Inner Branch—less prominent and running down to the Lower Tubercle of Femur on the Inner Tuberosity, (and attaching two muscles—one internally and one externally), and interrupted at the middle by a smooth Groove which contributes to form a Canal (for the passage of an artery) ;

Popliteal A. V. & N.

3. The Lower Interval—usually called the Popliteal Space of the Femur, which is the space included between the two Branches of the Lower Bifurcation, and corresponds to the region of the Thigh called the Ham; and which (supports blood-vessels and nerves, and) presents—

The two heads of the Gastrocnemius M.

Two Rough Impressions—one on each side, just above the Condyles (for attaching muscles).

Contd.—2 **The External** border—indistinct, extending from the Anterior Inferior Angle of the Trochanter major to the Anterior Extremity of the External Condyle (and at-
Of the crureus M. | taching muscular fibres);

3. **The Internal**—commencing as a vertical ridge from the Spiral line opposite the Trochanter minor, becoming very indistinct in the middle, and terminating below at the Anterior Extremity of the Internal Condyle.—
Of the Crureus M. | (This also gives attachment to muscular fibres).

II. Surfaces—likewise three, and not well marked:—

1. **Anterior**—looking somewhat outward above, and narrow and convex in the middle, but flat and expanded at the extremities (Its upper three-fourths give origin
Crureus M. | to a muscle that glides over its lower fourth).

2. **External**—continuous above with the outer Surface of the Trochanter major and below with that of the Outer Condyle. (Its upper three-fourths likewise
Crureus M. | give origin to a muscle, that covers it throughout).

3. **Internal**—continuous above with the lower Border of the Neck, and below with the inner Surface of the Inner Condyle. It is smooth (and covered by a
Vastus Internus M. | muscle).

[**Structure**—is the most perfect specimen of that of a cylindrical bone, it being spongy at the Extremities and quite compact in the Shaft, forming the hollow medullary tube.

Articulations:—by the Head with the INNOMINATE; and by the Lower Extremity with the PATELLA in front, and with the TIBIA below.

[**Development**—as two pieces **at birth**, from two points, that remain separate up to the 20th year of life:—

I. **The Shaft**—ossifying from one point, that appears after the first month of gestation;

II. **The Lower Extremity**—including the CONDYLES and TUBEROSITIES—ossifying from another single point, that appears in the last month of gestation.

The Upper Extremity—is developed **after birth** from three points:—

I. THE HEAD—from one point, appearing at the end of the first year;

II. THE GREAT TROCHANTER—from another point, appearing in the fourth year;

III. THE SMALL TROCHANTER, from a third point, appearing in the fourteenth year.

These different pieces join together just in the reverse order until the bone is completed after the 20th year.

THE LEG—

Is mainly formed of two long bones—the Tibia and Fibula, with an appendage-like short bone called the Patella.

1. THE TIBIA-

Is the larger and internal of the two long bones of the leg. It is prismatic in the Shaft, and expanded at the Extremities, especially at the upper, and presents—

I. The Upper Extremity—which is twice as large as the Lower, and oblong, being transversely long, and divided into two parts, called the—

Tuberosities of the Tibia—which are continuous with each other in front, but separated behind by the—

Posterior Crucial L. Popliteal Notch (that attaches a ligament); and which have—

Surfaces—five for each;—

1. Superior—two, showing—

(1.) **Two Concavities**—which are oval, for articulation with the Condyles of Femur; of these the—

The Internal—is longer and more concave;

The External—being more wide and also concave:

(2.) **The Spinous Process** of the Tibia—situated between the Concavities, somewhat at the back part, with Two Tubercles on the summit (and attaching ligaments before and behind); *Fibrous ends of the Outer semilunar C.*

(3.) **Rough Depressions**—just before and just behind the Spinous Process (giving attachment to ligaments;—

Anterior crucial & front end of Inner semilunar C. Front Depression—to two;

Posterior crucial & Back end of Inner semilunar C. Back Depression—to two others):

2. Lateral—two, both convex and rough, (the inner attaching a ligament of the knee); *Internal Lateral L.*

3. Anterior—two, continuous with each other forming together a triangular Surface, which is wide above, and terminates below at the—

Tubercle of the Tibia—which is rough at the lower part (for attaching a ligament) and smooth at the upper part (for lodging a bursa for the free gliding of the same); *Ligamentum Patellæ.*

Contd.— 4. **Posterior**—two, also joined together, and presenting—

(1.) The Popliteal Notch—at the middle and
Posterior crucial L. | shallow (and attaching a ligamemt);

(2.) A Horizontal Groove—on the INNER
Semi-membranosus M. | TUBEROSITY (for attaching a muscle);

(3.) An Articular facet—on the OUTER TUBEROSITY, which is circular and directed downwards for articulation with the Fibula;

(4.) An Oblique Groove—on the OUTER TUBEROSITY, just above the articular Facet, and
Popliteus T. | very shallow (for transmitting a tendon).

II. The Lower Extremity—which is quadrilateral in form, and is transversely large; presenting a peculiar process, called the Malleolus Internus, descending from its inner side; and which has—

Surfaces—five—

1. **Anterior**—smooth and convex, (and covered by seve-
Extensors of the toes. | ral tendons);

2. **Posterior**—showing—

An Oblique Groove—which is very shallew and indistinct, running downwards and inwards (and
Flexor longus pollicis M. | transmitting a tendon);

3. **Inferior**—quadrilateral in form and wider externally, being concave antero-posteriorly but alternately convex and concave from side to side, and presenting—

AN ANTERO-POSTERIOR RIDGE—separating—

TWO LATERAL DEPRESSIONS—of which the—

INTERNAL ONE—is continuous with the Outer aspect of the Malleolus Internus;

4. **External**—showing—

A Triangular Excavation—which is throughout rough (for attaching a ligament), and is bounded
Interosseous L. | by—

Two Ridges—one in front and one behind, (both at-
Anterior & Posterior L. of the Lower Tibio Fibular joint. | taching other ligaments);

5. **Internal**—convex and subcutaneous and prolonged into a peculiar Process, called the Internal Malleolus.

The Malleolus Internus—which is pyramidal but flattened from within outwards, presenting—

Surfaces—two—

Internal—convex and subcutaneous ;

External—smooth and continuous with the articular Surface of the Lower Extremity ;

Borders—three—

Anterior—rough (for attaching some ligaments of the
Tibio-tarsal L. | Ankle);

Inferior—also rough, (attaching other ligaments of
Internal Lateral L. | the Ankle) ;

Posterior—presenting—

Tibialis posticus & | A DOUBLE GROOVE—(for transmit-
Flexor communis digitorum M. | ting two tendons).

III. The Shaft—prismatic and curved twice

upon itself, so that the inner aspect is convex at the upper part and concave at the lower. It is also somewhat twisted so that its Posterior surface is backward above, but backward and outward below. It is thinnest about the middle of its lower half ; and it presents—

Borders—three—

1. **Anterior**—called the **Crest** of the Tibia—being the most prominent of the three, and commencing above at the Tubercle and terminating below at the anterior Border of the Malleolus. It is sinuous, and turned outwards above and inwards below ; and is sharp and prominent at the upper and middle parts but rounded below. It is subcutaneous throughout, (and at-
Ap. of the Leg. | taches an aponeurosis).

2. **Internal**—distinct only in the middle, but extending
Popliteus Soleus &Flexor longus digitorum M. | from the posterior part of the Inner Tuberosity to the posterior Border of the Malleolus, (and attaching three muscles);

3. **External**—commencing from the front of the articular Facet at the lower aspect of the External Tuberosity and terminating at the TWO RIDGES bounding the rough Concavity at the outer aspect of the Lower Extremity. It is sharp especially at the middle (and gives
Interosseous L. | attachment to a ligament in its whole length).

Surfaces—three—

1. **Posterior**—divided into two parts by—

Popliteal F. & Soleus M.

The Oblique Line of the Tibia—running from the articular Facet for the Head of the Fibula downwards and inwards to the Internal Border, which it meets below the upper third of the bone; and being rough (for giving insertion to a fascia and part of a muscle);

Popliteus M.

The Upper Portion of the surface—being triangular, small and concave longitudinally (for attaching a muscle):

Tibialis posticus & Flexor communis digitorum M.

The Lower Portion of the surface—large, flat and smooth throughout, looking somewhat outwards below (and attaching two muscles by its upper two-thirds) and presenting the—

MEDULLARY FORAMEN—immediately below the Oblique Line, going obliquely downwards.

2. **Internal**—smooth—

F. from the Gracilis Sartorius & Semitendinosus T.

The Upper Portion—small, wide and looking somewhat forwards (and covered by a fascia):

The Lower Portion—large, looking inwards and subcutaneous:

3. **External**—more or less rough—

Tibialis anticus, Extensor proprius pollicis, Extensor communis digitorium & Peroneus tertius M.

The Lower Third—looking a good deal forwards and covered by four tendons);

Tibialis anticus & Extensor communis digitorum M.

The Upper Two-thirds—grooved (for attaching two muscles).

[**Structure**—same as that of all long bones.

[**Development**—by three points:—one for the Shaft and one for each Extremity. The first appears after the 1st month of fœtal life. The Upper Extremity appears within the first year, and the Lower within the 2nd year after birth. The Lower epiphysis is the first to unite with the Shaft; and the bone is complete by the 25th year.

Articulations—with the FEMUR and the HEAD of the FIBULA above; and with the ASTRAGALUS and the INFERIOR EXTREMITY OF THE FIBULA below.

THE FIBULA.

Is the most slender of all long bones, and placed on the outer side of the Tibia, with a general convexity towards it; it is irregularly prismatic at the upper part and flattened below; having the—

I. Extremities—two—

1. Superior called the **Head**—which is irregularly rounded, presenting the—

- **1. Articular Surface**—flat, and directed upwards, forwards and inwards, to articulate with the Facet on the Outer Tuberosity of the Tibia;
- **2. Styloid Process**—projecting upwards from the BACK part of the Head, (and giving attachment to a ligament of the Knee); — *Short External Lateral L.*
- **3. Circumference**—uneven and rough (for attaching muscles and ligaments;—
  - **Externally**—one ligament and two muscles; — *Long External Lateral L. & Biceps & Peroneus longus M.*
  - **Internally**—one ligament only; — *Tibio-fibular L.*
  - **Anteriorly**—one ligament and two muscles; and — *Tibio-Fibular L. & Biceps & Peroneus longus M.*
  - **Posteriorly**—one ligament and one muscle): — *Tibio-fibular L. & Outer head of Soleus M.*

2. Lower—known as the **Malleolus Externus**—which is larger and much longer than the corresponding (External) Malleolus of the Tibia; and is of the shape of a triangular pyramid, with its apex below, descending downwards and outwards, (attaching a ligament) and having three surfaces separated by three borders:— *Middle External Lateral L.*

- **1. Borders**—three, all converging downwards at the summit;—
  - (1.) **Anterior**—thick, uneven and marked at its lower part with A ROUGH IMPRESSION—(for attaching a ligament of the Ankle); — *Anterior External Lateral L.*
  - (2.) **External**—prominent, forming the outer boundary of a Groove on the posterior surface;
  - (3.) **Posterior**—smooth and rounded:
- **2. Surfaces**—three—
  - **Outer or Anterior**—convex and subcutaneous, and continuous with a Triangular Surface at the lower part of the Anterior Surface of the Shaft;
  - **Inner**—divided into two portions;—
    - (1.) ARTICULAR PORTION—situated above and in front, being triangular in form and convex, for articulation with the side of the Astragalus;
    - (2.) NON-ARTICULAR PORTION—situated behind and below, and rough and depressed (for attaching a ligament of the Ankle); — *Posterior External Lateral L.*
  - **Posterior**—narrow and oblique, and marked with—
    - A GROOVE—which is shallow (for transmitting two tendons); — *Peroneus longus & brevis T.*

II. Shaft—slightly curved longitudinally, and somewhat twisted in the outline. It is also a little inclined in its position, and is prismatic above and flattened below : and it presents, like other long bones, three Surfaces and three Borders:—

1. Borders—three—

Anterior or **External**—commencing from the front of the Head and running vertically downwards as far as the middle, and then curving outwards to bifurcate below, so as to form the two sides of a triangular subcutaneous Surface, that is continuous with the outer Surface of the Lower Extremity. (The upper single portion gives attachment to an intermuscular septem, separating the outer muscles of the leg from the front ones ; and the Outer Branch of the Lower Bifurcation goes to meet the Outer border of the Malleolus externus).

Peroneus longus & brevis M.
Extensor communis digitorum & Peroneus tertius M.

Interosseous or **Internal**—nearly parallel to the Anterior border at the upper part, but diverging from it below, and terminating at the apex of a rough triangular Space, situated immediately above the articular surface of the Malleolus Externus. (It gives attachment to a ligament, that separates two sets of muscles).

Interosseous L. Flexor from Extensor M.

Posterior—commencing above at the base of the Styloid Process, and terminating below at the posterior Border of the Malleolus Externus, (and giving attachment to an intermuscular septum, that separates the outer muscles of the leg from the back ones):

Peronei M. from Soleus & Flexor longus pollicis M.

2. Surfaces—three—

Anterior—very narrow, specially at the upper two thirds, where it is flat ; but somewhat wider below, where it is slightly grooved for awhile, after which it turns outwards and becomes continuous with the outer Surface of the Malleolus Externus. It presents—

1. **A Ridge**—that forms a continuation, as it were, of the anterior border of the Malleolus Externus ; and, going upwards and backwards, meets the Anterior border of the Shaft about three inches above that process. This divides the anterior surface into two parts :—
2. **The Upper Part**—narrow above and looking anteriorly, and grooved below, (and giving insertion to three muscles) ;

   Extensor communis digitorum & Peroneus tertius & Extensor proprious pollicis M.
3. **The Lower Part**—rather convex and subcutaneous, and looking OUTWARDS, forming, in fact a portion of the Outer surface of the Shaft, and bounded by the two branches of the lower Bifurcation of the Anterior Border ; and which forms a continuation, as it were, of the Outer surface of the Malleolus Externus.

Contd.—**External**--looking outwards above but backwards below; and having the—

Upper Two-Thirds—uneven and grooved (for attaching two muscles);

Lower Third—being smooth (for transmitting the two tendons, that ultimately pass along the back Surface of the Malleolus Externus):

Peroneus longus & brevis M.

Internal—also divisible into two portions:—

Lower Third—smooth and plane, and looking directly inwards, presenting—

1. A Triangular Space—which is convex and rough, and situated just above the Articular surface of the Malleolus Externus, (for attaching strong ligaments to bind the Fibula down to the Tibia);

Lower Tibio-fibular L.

2. A Smooth Surface—above this, which becomes continuous with the posterior portion of the upper two-thirds (and gives insertion to a muscle);

Flexor longus pollicis M.

Upper Two-Thirds—again divided into two portions by—

The Oblique Line of the Fibula—which commences above at the inner side of the Head, and, descending vertically for awhile, turns forwards, to terminate at the Interosseous border a little below the middle of the bone. (It gives attachment to an intermuscular septum, separating two muscles).

Flexor longus pollicis & Tibialis posticus M.

The Anterior Portion of the upper two-thirds—bounded behind by the Oblique line, and in front by the internal Border, and looking a good deal forwards and grooved (for attaching a muscle);

Tibialis posticus M.

The Posterior Portion—bounded in front by the Oblique line and behind by the Posterior border; and looking inwards and backwards at the upper part but becoming continuous below with the smooth lower third of the surface; and presenting—

1. A Roughness—at the upper part (for attaching a muscle);

Outer head of Soleus M.

2. A Smooth Surface—at the middle of the bone (for attaching another muscle);

Flexor longus pollicis M.

3. The Medullary Opening—at about the middle of the shaft, running obliquely downwards.

[**Structure**—unusully compact at the Malleolus and very strong.

[**Development**.—One piece at birth, as the Body, from a single point, appearing at the Seventh week of fœtal life.

THE LOWER EXTREMITY—from another point, that appears at the 2nd year after birth ; and

THE UPPER EXTREMITY—from a third point, that appears at the fourth year after birth.

N. B.—The consolidation of the bone takes place after the 20th year ; and is quite exceptional – the LOWER Epiphysis joining first.

Articulations—with the TIBIA above and on its inner side, and with the ASTRAGALUS below.

THE PATELLA OR THE KNEE-CAP-

A flat triangular bone with rounded angles. It is broader and thicker above than below, and is situated vertically in front of the Knee-joint, forming the Knee-pan, and having—

Surfaces—two –

Quadriceps Extensor M.

Anterior—convex and striated (for the attachment of a big tendon) ;

Posterior—divided into two portions—

Ligamentum Patellæ.

LOWER PORTION—rough and perforated with holes (and attaching a ligament) ;

UPPER PORTION—smooth and transversely long, presenting—

1. A MEDIAN RIDGE—which fits into the trochlear Groove between the Condyles of the Femur ;
2. TWO LATERAL CONCAVITIES—which fit upon the prominences of the Condyles of Femur; and in correspondence to these, the External concavity is larger than the internal :

Borders—three—

Lateral L. of Patellæ & Quadriceps T.

1. & 2. **Lateral**—thin and curved (giving attachment to ligaments and tendons) ;

Quadriceps Extensor T.

3. **Upper Border or Base**—thick and oblique, encroaching on the anterior aspect of the bone, (and attaching a big tendon) :

Ligamentum patellæ.

Apex—thin and situated below, (giving attachment to a strong ligament) ;

[**Structure**—of light cancellous tissue, enveloped in a thin compact layer.

[**Development**—from one point of ossification, which appears at the third year after birth.

[**Articulations**—with the FEMUR only.

Mechanism of the Leg.—The Knee-joint is a hinge-joint, whose flexion is limited to an Angle of 40° and extension to *Lateral & crucial L* | a straight line:—this limitation is effected, not by bones, but by ligaments and by the oblong elliptical form of the condyles. There is a certain degree of rotatory motion possible during flexion, when the rounded back ends of the Condyles come to lie in the concavities on the Tibia; and it is effected by an alternate rotation of either Condyle round the other, while *Crucial L.* | both condyles are prevented (by ligaments) from advancing or receding together at the same time. In the hinge-movements the Patella follows all the elliptical surface of the Condyles, so that it is pushed forwards in extension and backwards in flexion, thus showing force in the former and velocity in the latter motion, the ligamentum patellæ being on the stretch during extension. The Fibula is merely an accessory bone in the Leg, allowing more space for muscular insertion, than serving any actual purpose like the corresponding bone of the Fore-arm. The upper Tibio-Fibular articulation is a simple gliding joint, while the lower is more fixed by strong ligaments and is of the mixed variety.

THE FOOT—

Corresponding to the Hand of the Upper Extremity, and composed of 27 bones and 32 joints and divided into—

1. **THE TARSUS**—corresponding to the Carpus and consisting of 7 Cuboid bones;
2. **THE METATARSUS**—corresponding to the Metacarpus and consisting of 5 long bones;
3. **THE PHALANGES**—corresponding to the Fingers and consisting of 14 long bones.

I. THE TARSUS—

Consisting of seven bones, arranged in two lateral groups, of which the—

1. **External Group**—is remarkable for solidity and strength, and consists of two bones placed one before the other;—

   Calcaneum—behind;

   Cuboid—in front:

2. **Internal Group**—is very elastic, consisting of five bones; of which the—

   1. **Astragalus**—is behind;
   2. **Scaphoid**—in front of that;
   3. **Three Cuneiform bones**—the foremost of all, in a transverse row.

I. THE OUTER GROUP OF THE TARSAL BONES—

1. THE CALCANEUM OR THE OS CALCIS—

Which is the largest bone of the Foot, and is elongated in form, with the posterior extremity large, forming the prominence of the Heel, and the anterior extremity small, forming what is called its Greater Process. It has—

Surfaces—six—

1. **Superior**—presenting—
   1. **Two Articular Surfaces**—in the middle, which are oblong in shape, with their long diameters outwards and forwards and which are transversely plane for articulation with the Astragalus ; of these the—
      1. **External**—is large and convex longitudinally, situated on the body of the bone, and is wider behind than before ;
      2. **Internal**—is somewhat anterior and longitudinally concave and is supported by the Lesser Process;
   2. **An Oblique Groove**—separating these two Surfaces and running from behind outwards and forwards, and rough (for attaching a ligament) ;
      Interosseous astragalo-calcanean L.
   3. **Upper aspect of the Greater Process**—just in front of the Larger Articular Surface, and rough, presenting—
      An Irregular Depression—continuous with the oblique Groove (and attaching several ligaments with a muscle) :
      Above L. & also supr. calcaneo-Scaphoid & Intl. calcaneo-cuboid L. & Extensor brevis digitorum M.
   4. **Upper aspect of the Heel-Portion**—which is situated just behind the larger articular surface, and is convex transversely and concave longitudinally,
2. **Inferior**—narrow, transversely convex and wider behind, presenting—
   1. **Two Tubercles**—at the back part ; of which the—
      1. **External**—is small and rounded (giving attachment to a muscle) ;
         Abductor minimi digiti. M.
      2. **Internal**—large, (attaching two muscles) and having—
         Adductor brevis pollicis & Flexor brevis digitorum.
         1. An Inferior Surface—broad, for supporting the Heel ;
         2. An Inner Border—prominent, to deepen the concavity of the Inner surface :

Contd.—**2. A Rough Depression**—between the Tubercles,
Long Planter L. | (forattaching ligaments) ;

3. A Striated Surface—in the middle, (for attach-
Flexor accessorius & brevis digitorum M. | ing muscles) ;

4. A Single Tubercle—in front, which is rough (for
Short Planter L. | attaching a ligament) ;

5. A Transverse Groove—in front of this Tu-
Calcaneo-cuboid L. | bercle, which is also rough (for attaching a 3rd set of ligaments.)

3. External—presenting—

1. A Wide Surface—behind, (for attaching a liga-
Extl. astragalo-calcanean L. | ment) ;

2. A Prominent Tubercle—at the middle, (for at-
Middle external lateral L. | taching another ligament of the Ankle) ;

3. A Narrow Surface—in front, belonging to the Greater Process of the bone, and presenting—

1. **Two Oblique Grooves**—passing downwards and
Peroneus longus & brevis M. | forwards, (and transmitting two tendons) ;

2. **A Tubercular Ridge**—separating the two Grooves
Exterl. annular L | (and attaching an aponenorosis) ;

4. Internal—presenting—

1. The Lesser Process—a curved plate, projecting horizontally inwards from the anterior superior part of this surface, having its—

Upper Surface—supporting an oval ARTICULAR facet —for articulation with the Astragalus ;

Lower Surface—convex and channelled by a Groove,
Flexor communis digitorum & Flexor longus pollicis M. | which is sometimes double (for transmitting two tendons) ;

Circumference—rough (for the attachment of liga-
Internal lateral & calcaneo-scaphoid & Astragalo-calcanean L. | ments):

2. An Oblique Concavity—formed by the projection of the Lesser Process in front and the
Plantar N. A. & V. & Flexor T. | Inner large tubercle on the Inferior surface behind, and directed obliquely downwards and forwards (for transmitting vessels, nerves, and tendons of the foot) ;

3. An antero-posterior Line—indicating the line of separation of the Inner from the Lower surface,
Flexor accessorius M. | (and attaching a muscle) ;

5. **Posterior**—wider below than above, and divided into two parts—

   1. **Lower Portion**—convex and rough (for attaching a big tendon); *Tendo achillis of the gastrocnemius M.*

   2. **Upper Portion**—flat and more smooth (for supporting a synovial bursa);

6. **Anterior**—smooth and sinuously curved, irregularly triangular in form and corresponding to the posterior surface of the Cuboid bone. It forms the anterior aspect of the—

   Greater Process—which is but the narrow front part of the bone, having—

   1. **Anteriorly**—the ARTICULAR SURFACE, which is triangular and sinuously curved, with an overhanging plate of bone at its inner and upper part, for articulation with the back surface of the Cuboid bone;

   2. **Superiorly**—a ROUGH SURFACE—forming the irregular depression on the upper surface of bone (for attaching ligaments);

   3. **Inferiorly**—the ANTERIOR TUBERCLE, with the transverse GROOVE of the Lower Surface;

   4. **Externally**—a TUBERCLE, separating two oblique GROOVES at the front part of the Outer Surface;

   5. **Internally**—a LITTLE PROJECTION, that is continuous with the Lesser Process, embracing with a similar Process of the Cuboid bone.

2. THE CUBOID BONE-

Forming an anterior prolongation of the Os Calcis, is cubical in form and is somewhat pyramidal in shape, having the base upwards and inwards and the truncated apex in the opposite direction. It has—

Surfaces—six, like other short bones;—

1. **Superior** or **dorsal**—looking ob'iquely upwards and outwards, being broader internally than externally and rough (for attaching ligaments); *Dorsal Tarsal L.*

2. **Inferior** or **planter**—more extensive, especially along the Internal border and looking downwards and inwards, and presenting—

Contd.—1. **A Ridge**—passing obliquely forwards and inwards, and having—

Of the Peroneus longus T.

THE TUBEROSITY of the Cuboid bone—at its outer extremity, which is convex with AN ARTICULAR FACET for articulation with a Sesamoid bone ;

Peroneus longus T.

2. **A Smooth Groove**—bounded behind by the above Ridge (and transmitting a tendon) ;

Inter-tarsal L.

3. **Anterior Lip** of the Groove—like the Internal and Posterior Borders, rough (for attaching ligaments) :

3. **Posterior**—triangular and directed backwards and outwards ; smooth and sinuous, corresponding to and articulating with the Anterior Surface of the Calcaneum ; and presenting—

   A backward Prolongation—at the inner and lower part, which supports a similar process of the Calcaneum :

4. **Anterior**—smooth and triangular, directed forwards and outwards, and divided by a RIDGE into two Facets ;—

   1. **Inner Facet**—quadrilateral and concave, for articulation with the Fourth Metatarsal bone ;
   2. **Outer Facet**—triangular and large, and very slightly concave, to articulate with the Fifth Metatarsal bone :

5. **Internal**—forming the BASE of the pyramid that represents the bone, and directed inwards, upwards and slightly forwards ; presenting—

   1. **A Smooth Surface**—at the middle of the upper part for articulation with the External Cuneiform bone ;
   2. **An Occasional Facet**—behind the above, and small, for articulation with the Scaphoid bone ;

Cubo-Cuneiform & Cubo-Scaphoid L.

   3. **The remainder** of the Surface—rough (for attaching two ligaments) ;

6. **External**—narrow and directed outwards and downwards, forming the truncated apex of the bone, and presenting the commencement of the RIDGE and the GROOVE on the Inferior Surface.

2. *THE INNER GROUP OF THE TARSUS—*

Consisting of five bones :—

1. THE ASTRAGALUS.

Which is the largest bone of this Group, and next to the Calcaneum in all Foot. It is the highest bone of the Tarsus and rests upon the Calcaneum below, supporting the Leg above, and articulating with the Malleoli on the sides. It is divisible into a Head in front, supported by a contracted Neck, and a Body behind; and it presents like other Cuboid bones—

Surfaces—six—

1. **Superior**—showing—
   1. **The Trochlear Surface**—at the back part, which is wider before than behind, being convex antero-posteriorly and slightly concave laterally, for articulation with the Lower End of the Tibia;
   2. **A Rough Depression**—in front, supported on the Neck, (and attaching two ligaments): *Ant: Tibio-Tarsal & Astragalo-scaphoid L.*
2. **Inferior**—showing—
   1. **An Oblique Groove**—running forwards and outwards, and rough (for attaching ligaments, and) separating— *Interosseous L.*
   2. **Two articular Surfaces**—which are oblong, elongated from behind outwards and forwards, and parallel to each other, for articulation with corresponding surfaces on the Os Calcis; of the Surfaces the—
      - EXTERNAL—is large and broad, being wider behind and concave along its length;
      - INTERNAL—is narrower but is as long as the Outer, and is convex longitudinally, being divided in some cases into two parts; of which the—
        - POSTERIOR PART—is large, to articulate with the Lesser Process of the Calcaneum;
        - ANTERIOR PART—is small, to allow the free gliding of a ligament: *Long Plantar L.*
3. **Internal**—showing—
   1. **An Oblong articular Surface**—at the upper part, which is continuous with the Trochlear surface above, and is directed inwards, upwards and backwards, for articulation with the Inner Malleolus of the Tibia;
   2. **A Rough Excavation**—below it (for attaching a ligament): *Deep Internal Lateral L.*
4. **External**—showing—
   1. **A Triangular articular Surface**—at the middle of the upper part, which is continuous with the Trochlear surface above, and is somewhat concave vertically but convex in the opposite direction, and is directed upwards, outwards and backwards, for articulation with the Outer Malleolus of the Fibula;
   2. **Rough Impressions**—below and behind the Articular Surface (for attaching two ligaments); *Back part of External Lateral&External Calcaneo-astragaloid L.*
   3. **Outer border of the Neck**—in front of the Articular Surface, and rough (for attaching a ligament): *Front part of External lateral L.*

Contd.—5. **Posterior**—very small and traversed by—

An Oblique Groove—running downwards and inwards
Flexor longus pollicis T. | (for transmitting a tendon);

6. **Anterior**—forming the—

Head of the bone—which is oval, smooth and convex, being broader at the outer than at the inner part, and is elongated downwards and inwards, and is divided into two portions;—

Upper Portion—large and rounded, to articulate with the Scaphoid bone;

Lower Portion—triangular and oblique, and continuous with the anterior portion of the internal Articular surface on the Inferior surface of the bone,
Inferior Calcaneo-scaphoid L. | and meant for gliding over a ligament.

* * *

2. THE SCAPHOID OR NAVICULAR BONE.

Is oval and boat-shaped; being concave behind and convex before, and pointed at its inner extremity. It has its long axis inclined downwards and inwards, and it is thicker above than below, presenting—

Surfaces—six, like other cuboid bones;—

1. **Posterior**—oval, concave and smooth, and somewhat broader externally, for articulation with the Head of the Astragalus, which it imperfectly receives;
2. **Anterior**—oblong and convex, smooth and divided by two vertical Ridges into three parts or Facets; of which the—
   1. Inner Facet—is large, and convex, and wider below, for articulation with the Inner Cuneiform bone;
   2. Middle Facet—is next in size and triangular, being wide above and sinuously curved, for articulation with the Middle Cuneiform bone;
   3. Outer Facet—is the smallest in size and slightly concave, being wider above, for articulation with the Outer Cuneiform bone:

3. **Superior**—wide, convex and rough, and looking upwards
Dorsal Tarsal L. | and inwards, (and attaching ligaments);

4. **Inferior**—narrower than the Upper, and rough (for at-
Calcaneo-scaphoid, | taching other ligaments);
Plantar Tarsal L. |

5. **Internal**—prolonged into the—

Tuberosity of the Scaphoid—which goes downwards and
Tibialis posticus T. |
Calcaneo-scaphoid & | inwards (for attaching a tendon and two liga-
Scapho-cuneiform L. | ments);

6. **External**—rough (for attaching a ligament and) presen-
Cubo-scaphoid L. | ting—

A Small articular Facet—at times, for articulation with the Cuboid bone.

3. THE CUNEIFORM BONES-

Which are three wedge-shaped bones, placed side by side, all in front of the Scaphoid, and articulating in front with the first three Metatarsal bones. They are named from within outwards—the **First**, the **Second**, and the **Third** Cuneiform bones.—

1. THE FIRST OR THE INTERNAL CUNEIFORM BONE—

The largest of the three, and the only one with its base downwards descending lower than the others, so as to form, with the Tuberosity of the Scaphoid, a thick prominence, to deepen the lateral concavity of the Sole of the Foot. It has its—

Surfaces—six, like other cuboid bones;—

1. **Posterior**—triangular and concave, wider below and smooth, for articulation with the Inner Facet of the Scaphoid;

2. **Anterior**—semilunar, broad and looking somewhat inwards above, and smooth, for articulation with the First Metatarsal bone;

3. **Superior**—a mere edge representing the tip of the wedge, *Dorsal Tarsal L.* | and rough (for attaching ligaments);

4. **Inferior**—forming what is called—

The Tuberosity of the Internal Cuneiform bone—which *Plantar tarsal & Tarso-metatarsal L. Tibialis anticus & posticus, & Flexor brevis pollicis M.* | is a thick ridge (for attaching three muscles and ligaments);

5. **Internal**—broad, quadrilateral and convex, and rough (for *Dorsal L.* | attaching ligaments, and) presenting—

A Small Facet—at the lower part in front (over which a *Tibialis anticus T.* | tendon glides);

6. **External**—presenting—
    1. **A Rectangular articular Surface**—along the upper and posterior Borders, and sub-divided into two parts or Facets;—
        1. ANTERIOR FACET—concave and small, for articulation with the side of the Second Metatarsal bone;
        2. POSTERIOR FACET—slightly concave and continuous with the posterior surface of the bone, for articulation with the Middle Cuneiform bone;
    2. **Rough Space**—below and in front of the Articular *Interosseous & Inter-& Meta-tarso-tarsal L.* | surface (for attaching ligaments).

2. THE SECOND OR THE MIDDLE CUNEIFORM BONE— The smallest of the three bones, and a proper wedge, having the base upwards and the back part wider. It leaves an open space in front, between the Inner and Outer Cuneiform bones, into which the Second Metatarsal bone is as it were pushed back. This Middle Cuneiform bone has—

Surfaces—six—

1. **Posterior**—triangular, sinuous and smooth, for articulation with the middle portion of the anterior surface of the Scaphoid;
2. **Anterior**—also triangular and sinuous, but smaller and looking somewhat outwards, for articulation with the extremity of the Second Metatarsal bone;
3. **Internal**—quadrilateral, presenting—
    1. **A Rectangular articular Facet**—along the upper and posterior Borders, which is single and convex, for articulation with the Internal Cuneiform bone;
    2. **A Rough Depression**—below and in front (for attaching a ligament); *Inter-cuneiform L.*
4. **External**—presenting—
    1. **A smooth Facet**—along the Posterior margin, which is concave, for articulation with the External Cuneiform bone;
    2. **A Rough Space**—in front (for giving attachment to a ligament): *Inter-cuneiform L.*
5. **Superior**—quadrilateral, and wider behind, and rough (for attaching ligaments); *Dorsal L.*
6. **Inferior**—narrow and tubercular, forming the apex of the wedge (and attaching a ligament). *Inter-cuneiform L.*

---

3. THE THIRD OR THE EXTERNAL CUNEIFORM BONE— Which is smaller than the First but larger than the Second Cuneiform bone, and is placed with its base upwards nearly at the centre of the Foot; and which projects considerably forwards, beyond all the bones of the Tarsus excepting the Inner Cuneiform bone; and which has—

Surfaces—six, like other bones of the series;—

1. **Posterior**—presenting—
    1. **A smooth Facet**—at the upper part, which is convex and small, for articulation with the outer portion of the anterior surface of the Scaphoid;
    2. **A Rough Space**—below (for attaching ligaments): *Inter-Tarsal L.*
2. **Anterior**—triangular, slightly concave and smooth, for articulation with the Third Metatarsal bone;
3. **Internal**—quadrilateral, presenting—
    1. **Articular Facets**—two, of which the—
        - (1.) SMALLER one—is situated at the anterior and superior corner, and is continuous with the Anterior surface, for articulation with the outer side of the Second Metatarsal bone;
        - (2.) LARGER one—is posterior, and along the Posterior border, being convex and elongated for articulation with the Middle Cuneiform bone:
    2. **A Rough Depression**—between the two Facets (for attaching ligaments): *Inter-cuneiform L.*

4. External—presenting, like the Inner Surface,

1. Articular Surfaces—two—

(1.) Smaller—at the anterior and superior corner and continuous with the Front surface, for articulation with the inner side of the Fourth Metatarsal bone;

(2.) Larger—posterior, concave, and roundish in outline, and situated only at the upper part, for articulation with the Cuboid bone:

2. A Rough Excavation—between the two Facets, and
Cubo-cuneiform L. | below (for attaching ligaments):

5. Superior—quadrilateral, representing the base of the
Dorsal L. | wedge, and rough throughout (for attaching ligaments);

6. Inferior—descending lower than the Second Cuneiform
Inter & Metatarso-Tarsal | bone but not so low as the First, and rough,
L. Flexor brevis pollicis | forming a tubercular ridge (for attaching
M. Tibialis posticus T. | ligaments, a muscle and a tendon).

◆

THE TARSUS AS A WHOLE—

Is formed of these seven bones, and is elongated in form, being narrow and free behind, where it rests upon the ground, and gradually widening in front where it articulates with the Metatarsus. It constitutes the larger portion of the Foot, and is so curved as to present a concavity below, which is concave both laterally and antero-posteriorly, and a corresponding convexity above. It is so constituted that, at the back part the Inner Group rest upon the Outer, while in front they spread out from each other, thus showing a sort of folding of the Foot so that, in its general outline, it presents four surfaces which are triangular and placed with the base of one towards the apex of the other; thus—

Surfaces—four—

1. Upper—broad before and narrow behind, presenting—

1. An Expanded Convexity—in front, formed by the Cuboid with the Head of the Os Calcis externally and the Scaphoid with the three Cuneiform bones together with the Head and Neck of the Astragalus internally, and showing the—

Dorsal Fossa of the Foot—bounded by the Greater Process of Os calcis below, Body of the Astragalus behind, and Neck of the Astragalus above and internally. It is open in front and externally, (attaches ligaments and muscles) and is continuous with the interosseous Channel between the Os Calcis and Astragalus, which opens in the Sole of the Foot between the two Processes of the Os Calcis;

2. The Trochlea of the Astragalus—in the middle;

3. The Upper Border of the Heel-projection of the Os Calcis—behind:

2. **Lower**—likewise broad in front and narrow behind, and remarkably tubercular in appearance, showing—
    1. **The expanded Concavity of the Foot**—in front, formed by the Cuboid and the Scaphoid with the Cuneiform bones, and presenting the—
        1. *Peroneus longus T.* | Ridge of the Cuboid—externally, with the—Tendon Groove—in front, which is continuous with the Lower of the two Grooves on the outer aspect of the Calcaneum;
        2. *Tibialis posticus M.* | Lower border of the External Cuneiform bone—in the middle and tubercular;
        3. *Tibialis posticus & anticus T.* | Tuberosities of the Scaphoid and Inner Cuneiform bones—internally:
    2. **The middle Cavity of the Sole of the Foot**—between the Head of the Astragalus and the Greater Process of the Calcaneum, showing the—
        1. Rough Surface of the Calcaneum—externally;
        2. *Long Plantar L.* | Smooth lower Aspect of the Head of Astragalus—internally;
        3. An open Space—at the middle, communicating with the Dorsal Fossa:
    3. **The lower aspect of the Heel-bone**—behind and narrow, with its—
        1. Three Tubercles—two behind and one in front;
        2. *Flexor communis & Flexor longus pollicis T.* | Tendinous Groove—on the Lesser Process internally:
3. **Inner**—broad behind and narrow in front, presenting the—
    1. **Inner side of Body of Astragalus**, with the **Inner Surface of Calcaneum**—behind, showing the—
        1. *Internal Lateral L.* | Malleolar Surface—above and square, with the—Inner Depression of Astragalus and the Extremity of Lesser Process of Os calcis—rough (for attaching ligaments);
        2. *Flexor T. & Plantar A. V. & N.* | Concavity of the Inner Surface of the Calcaneum—below:
    2. **Neck & Head of the Astragalus**—in the middle;
    3. **Tuberosities of the Scaphoid** and **Inner Cuneiform bones**—in front, forming a mere border:
4. **Outer**—likewise broad behind and narrow in front, showing the—
    1. **Outer Surface of the Astragalus** and **Calcaneum**—behind, forming an extensive surface, and presenting the—
        1. Articular Surface—for the Outer Malleolus above and triangular;
        2. *Middle External Lateral L of Ankle.* | Central Tubercle of the Calcaneum—below, (for attaching a ligament);
    2. **Outer aspect of the Greater Process of Calcaneum**—in the middle, with the—
        - *External annular L. Peroneus brevis & longus T.* | Tubercle and Two Oblique Grooves;
    3. **Apex of the cuboid bone**—in front, forming but a border— and showing its Tuberosity.

Extremities—two;—

Posterior—presenting the back part of the Calcaneum:

Anterior—very remarkable, formed by the Cuboid and the Cuneiform bones; and so oblique that its inner extremity is full half an inch in advance of the outer. It is quite uneven on account of the projection of the Inner and Outer Cuneiform bones.

[**Mechanism & Uses**—The Tibio-tarsal or the Ankle-joint is a hinge-joint, which is very safely protected on the sides by the two Malleoli, and in which in the normal or quiet state the Astragalus receives the whole pressure at right angles along the Tibia. From this position the foot can be raised or flexed only 10° and lowered or extended for about 20°. The posterior end of the Trochlear surface being narrower than the anterior, an amount of lateral motion becomes possible during extension of the Foot; and this circumstance with the situation of the Trochlea rather at the back part of the Foot, have an important bearing first in transmitting sudden shocks, with the foot extended and therefore through a smaller surface and a greater number of joints and (consequently with less concussion of the body); and secondly in supporting a continuous pressure with the foot in the median position and therefore through a larger surface and a less number of joints and thus making the support more direct and rigid.

The Intertarsal joints are altogether ten, with but four synovial cavities; thus—one for the Calcaneo-cuboid, one for the outer Astragalo-calcanean, one for the inner Astragalo-calcanean with the Astragalo-scaphoid, and one for the three scapho-cuneiform, two Inter-Cuneiform, the Cubo-cuneiform and (if it exists) Cubo-scaphoid joints. The four first joints are more moveable than the last six, and indeed the joints have been named very nearly in the order of their mobility. The necessary effect of this greater mobility of these joints is to depress and advance the outer portion of the Foot more than the inner, and thus to turn the Sole inwards. This flexion is equal to about 25°, while the opposite motion of extension does not exceed 10°. The inner division of the Tarsus has three convexities, of which two are vertical (the general longitudinal and transverse convexities of the Foot) and the third is transverse and inwards. This last is quite peculiar and with the greater arching of this side of the Foot makes it much more elastic than the outer portion, which is almost straight and rigid and acts more as a lever for the attachment of the Heel-tendon. The way in which the anterior extremity of the Tarsus articulates with the Metatarsal bones is also very peculiar; so much so that it breaks the shock of concussions (that usually fall upon the ball of the great toe), through the several joints of the Cuneiform bones, so that it is partially converted into a lateral force, the effect of which is to thrust outward the Cuboid bone, which probably for this reason presents its broad base towards this side of the Foot.

[**Development**—of all, excepting the Os Calcis, from a single point of Ossification;—

Os Calcis—begins to ossify in the 6th month of gestation,
Astragalus—in the 7th month, and
Cuboid—in the 9th;
External Cuneiform—in the First year after birth,
Internal Cuneiform—in the Third year,
Middle Cuneiform—and the Scaphoid—in the fourth year.
Epiphysis—only one in the whole Tarsus, for the back part of the Os Calcis, appearing about the tenth year and joining with the main portion during puberty.

◆

THE METATARSUS-

Consists of five cylindrical bones, which rest upon the ground at their anterior extremities, where they articulate with the toes, but are elevated at their posterior ends, at an angle of about 30°, where they articulate with the anterior irregular extremity of the Tarsus. They are numbered from within outwards, and are named as the FIRST, SECOND, THIRD, FOURTH and FIFTH METATARSAL BONES; each of these presents the—

I. Posterior Extremity—wedge-shaped (except that of the Fourth) having the—

1. **A Terminal Surface**—smooth, for articulation with the Tarsus;
2. **Lateral Aspects**—with articular FACETS and rough IMPRESSIONS, for articulation with the contiguous bones;
3. **Dorsal** and **Plantar Aspects**—rough, (for attaching ligaments):

II. Anterior Extremity—called the Head, having—

1. **A Terminal Convexity**—smooth and more extensive below, for articulation with the Phalanges;
2. **Lateral Aspects**—having each a Depression, surmounted by a Tubercle (for the attachment of muscles);
3. **Upper Aspect**—marked with a transverse Groove (for attaching a ligament);
4. **Lower Aspect**—marked with a SEMILUNAR Depression bounded on the sides by Condyloid Eminences—which are prolongations of the Terminal articular surface:

III. Shaft—curved so as to be convex upwards, and tapering anteriorly; the First and the Fifth being prismatic.

[**Structure**—like that of the Humerus.

[**Development**—of each, in two pieces:—

1. Body with the Tarsal End—from one point, appearing very early, in the second month of gestation;
2. Digital End—from another point, which begins to appear from the third year after birth,—first in the First, and then in the next and so on. This piece unites with the main piece by the 20th year.

N.B.—The First is peculiar in having the Digital End developed from the main piece, while the Tarsal End from an epiphysis.

THE METATARSAL BONES—differ from each other—

(1.) *IN SIZE*—thus;—the Second is the longest, then the Third, Fourth and Fifth, and last of all the First, which is the broadest and thickest of all;

(2.) *IN DIFFERENTIAL CHARACTERS*—thus the—

First—the most peculiar and shortest, with the dorsal aspect looking inwards, and with the—

Tarsal End—having the—

Terminal Surface—semilunar, and surrounded
Tarso-Metatarsal L. | by a Rough Groove (for the attachment of ligaments);

Lateral Surfaces—devoid of articular Facets,—
First dorsal Interosseous M. | (the outer attaching a muscle);

Inferior Angle—prolonged, forming a Tuberosity
Peroneus longus T. | (for inserting a tendon):

Head—remarkably broad, presenting—

A median Ridge—on the lower aspect, separating—

Two lateral Depressions—smooth, for the free gliding of the Sesamoid bones of the Great toe;

Shaft—strong and prismatic, with its—

Surfaces—three—

1. Plantar or Lower—concave longitudinal-
Flexor brevis pollicis M. | ly and plane laterally (and covered by a
Flexor longus pollicis T. | muscle and a tendon);

2. Dorsal or Inner—smooth, convex and subcutaneous, and looking inwards;

3. Outer—concave longitudinally and plane
First dorsal Interosseous M. | laterally as the Lower surface (and covered by a muscle):

Borders—three—

1. Outer—which is also inferior, extending from the Tuberosity of the Tarsal End to the Outer Condyle of the Head.
2. Inner—extending from the Inner Angle of the Tarsal End to the Inner Condyle of the Head;
3. Upper—extending from the Upper Angle of the Tarsal End to the Outer Lateral Tubercle of the Head.

Second—longest, being prolonged between the Cuneiform bones, and having the—

- **Tarsal End**—wide above and tubercular below, with the—
  - **Terminal Surface**—triangular, for articulation with the middle Cuneiform bone;
  - **Inner side**—showing—
    - A SMOOTH FACET—at the upper part, and
    - A ROUGH SURFACE—below, for articulation with the side of the Inner Cuneiform bone;
  - **Outer side**—showing—
    - TWO ARTICULAR SURFACES—one above and one below, each of which is subdivided into two facets;—
      - THE TWO FRONT ONES—looking more or less anteriorly and articulating with the side of the Third Metatarsal bone;
      - THE TWO BACK ONES—looking more or less backwards and articulating with the Outer Cuneiform bone:
- **Head**—flattened laterally, with the—
  - **Lateral Tubercles**—very prominent;
  - **Upper Aspect**—showing a transverse ridge (for attaching ligaments);
- **Shaft**—prismatic, with—
  - **Borders**—three—
    - LATERAL—extending from the two extremities of the Dorsal Surface of the Tarsal End to the Lateral Tubercles of the Head. These Borders approach each other at the middle and diverge at the ends.
    - INFERIOR—from the Inner Border of the Tarsal End to the Condyles of the Head. This is single at the back part, but double in front.
  - **Surfaces**—three—
    - SUPERIOR—narrow in the middle, and extensive at the ends, looking somewhat outwards (and covered by a tendon); *Extensor T.* |
    - LATERAL—approaching each other below (and attaching muscles), the inner being more extensive. *Dorsal Interossious M.* |

Third—having the—

- **Tarsal End**—triangular, showing the—
  - **Terminal Surface**—triangular, for articulation with the Outer Cuneiform bone;
  - **Inner Side**—with two articular Facets for articulation with with the Second Metatarsal bone;
  - **Outer Side**—with one articular Facet, for articulation with the Fourth Metatarsal bone;
  - **Under Aspect**—rough (attaching a muscle); *Abductor pollicis M.* |

Fourth—having the—

Tarsal End—cuboid, showing the—

Terminal Surface—quadrilateral, for articulation with the inner division of the front surface of the Cuboid bone ;

Inner Side—with an—

ARTICULAR SURFACE—divided into two Facets ;—

FRONT ONE—for articulation with the Third Metatarsal bone, ;

BACK ONE—which is narrow, for articulation with the Outer Cuneiform bone ;

Outer Side—with only one Facet for articulation with the Fifth Metatarsal bone :

Under Part—rough (attaching a muscle.)

Abductor pollicis M.

Fifth—having the—

Tarsal End—triangular, with the—

Terminal Surface—triangular, for articulation with the outer division of the front surface of the Cuboid bone ;

Inner Side—showing one articular Facet, for articulation with the Fourth Metatarsal bone ;

Outer Side—having a peculiar prolongation, which is called the—

TUBEROSITY OF THE FIFTH METATARSAL bone, (which attaches two tendons) ;

Peroneus brevis & abductor minimi digiti T.

Upper Surface—very wide ;

Lower Surface—also wide, (attaching a muscle):

Flexor brevis minimi digiti M.

Shaft—flattened from above downwards, being broad behind, and tapering in front where it curves outwards ;

Head—tubercular.

METATARSUS IN GENERAL–

Formed of these five bones, is quadrilateral in form, wider in front than behind, and having the—

Upper Surface—convex, more laterally than longitudinally ;

Lower Surface—concave ;

Inner Border—formed by the First bone, being thick and straight ;

Outer Border—formed by the Fifth, being thin and concave ;

Front Border—formed by the line of the Heads of these bones, and convex ;

Back Border—showing the range of the Tarsal Ends of these bones, and very uneven by the projections of the Second and of the Fourth and Fifth bones.

[**Mechanism**—The Tarso-metatarsal and the Inter-metatarsal joints are all gliding joints, allowing so much motion as to enable the Foot to adapt itself to the inequalities of the ground; and the inter-locking of these is beautifully suited to secure the bones against any dislocation. The greater strength of the First bone shows the usual line of passage of all ordinary concussions; and the concavity of the under surface of the Tarsus and Metatarsus affords room for the secure lodgment of the vessels and nerves of the Foot.

THE TOES-

Like the Fingers, are five in number; each consisting of three PHALANGES, exactly corresponding to those of the Hand, and resembling them both in structure and form,—with only this difference that these are rather diminutive in size, the First row being slender, the Second and Third very rudimentary. These can only be identified by their size, diminishing gradually from the First to the Last toe.

[**Development**—similar to that of the Metatarsal bones but somewhat later; and the peculiarity is that in these the Anterior End is developed out of the main piece, and the Posterior from an Epiphysis; the two pieces uniting by the 18th year after birth.

Body with the **Digital End**—appear about the third month of gestation, from a single point;

Tarsal End—appearing, from another point, about the 6th year after birth.

[**Mechanism**—similar to that of the Fingers, but the movements are more limited (with the exception of extension only, which is more extensive in the Toes) and especially adapted to sustain the weight of the body and bear concussions.

FINIS.

WELLCOME LIBRARY INSTITUTE

LUCKNOW:—AMERICAN METHODIST MISSION PRESS.

To be had at the Canning Library, 55, College
Street, Calcutta, or from the Publisher,
Lucknow, for Rs. 2 per copy.